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ARN Integrated Retail Module (IRM) & 3D Whole Body Scanner System at Ft. Carson, CO

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and increase efficiency; and, (3) Enhance operations and the effectiveness for the OCIE supply chain, and reduce costs in the overall process.

ARN's emphasis at the CIF was to research and optimize the OCIE supply chain, and evaluate incorporating a whole body scanner for automatic body dimension extraction and OCIE size prediction. A concurrent research effort was to implement the base foundation capabilities for the ARN systems for integration of this project into the Apparel Research Network (ARN) Supply Chain Management (SCM) initiatives.

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Preface

This Final Technical Report (FTR) covers project work accomplished for the Apparel Research Network (ARN)/Customer Driven Uniform Manufacture (CDUM) of the Defense Logistics Agency (DLA), in conformance with the AdvanTech, Inc. Delivery Order 0010 and the Human Solutions of North America, Inc. Delivery Order 0005, during the period 31 March 2004 to 30 September 2006.

This project is a joint research, implementation and evaluation effort of AdvanTech, Inc. and Human Solutions using 3D Whole Body Scanning technology. The project involved 4 principal tasks:

- 1) Implement the ARN Integrated Retail Module (IRM).
- 2) Implement the 3D Whole Body Scanner.
- 3) Integrate 3D Whole Body scanning technology with the ARN Integrated Retail Module (IRM) for clothing issue at the Central Issue Facility (CIF), Ft. Carson, CO; and,
- 4) Develop and validate dynamic local tariffs.

Additional information on Apparel Research Network projects is available from the Defense Logistics Agency.

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1.0 EXECUTIVE SUMMARY

1.1 Overview

This project report covers the implementation of the ARN Fully Automated Supply Chain Management solution, concentrating on the integration of ARN-IRM with the 3D Whole Body Scanner technology at the U. S. Army Central Issue Facility (CIF), Ft. Carson, Colorado. The focus of this project was on automation of uniform fitting and source data capture of issue and other operational data that is manually entered by the CIF staff into the U. S. Army Installation Support Module (ISM) software. The ARN-IRM implementation and ongoing support included:

- (1) The ARN Virtual Item Manager-Integrated Retail Module (VIM-IRM) web based inventory management application;
- (2) Both a wired and wireless ARN Local Area Network installed and operated outside the Ft. Carson firewall;
- (3) Scan form processing, and electronic forms filing and management;
- (4) Radio Frequency (RF) applications with hand-held terminals (HHTs) for receiving and warehouse data capture; and,
- (5) Legacy system interface development including integration of ARN-IRM and the 3D Whole Body Scanner facilitated automatic body measurement extraction, automatic item size selection, sizing validations, and reporting on the analysis and evaluation of the automatic measurement extraction on collected data.

The Apparel Research Network's on-going research initiatives have concentrated on evaluation of the 3D Whole Body Scanning technology for automatic uniform size selection of selected garment items to increase efficiency during the recruit clothing issuing process at Recruit Training Centers (RTCs), to perfect the recruit clothing tariff, and to improve the information used to manufacture garments.

Following successful application of the ARN-IRM and the 3D Whole Body Scanner technologies at the RTCs, it was recognized that similar research at a CIF could improve source data automation, asset management, and the issuing processes associated with Organizational Clothing and Individual Equipment (OCIE).

It was apparent through discussions made during site visits to a number of CIF's including Fort Carson that the U.S. Army tariff was inadequate for future requirements planning, new product implementation and inventory management. When Army "pushed items" into the CIF, for example the desert camouflage uniforms (DCUs), there were problems with sizing and excesses in many sizes because the item tariff did not match the requirement. In some instances, when used items were turned in after laundering, they were no longer the same size as when new, again causing sizing and stock problems.

The main goals of the ARN 3D scanning research initiative at the Ft. Carson CIF were:

- (1) Establish base-line information for future contracting and manufacture of uniforms;
- (2) Identify the correct uniform sizes required to reduce stock levels and increase efficiency; and,
- (3) Enhance operations and the effectiveness for the OCIE supply chain, and reduce costs in the overall process.

ARN's emphasis at the CIF was to research and optimize the OCIE supply chain, and evaluate incorporating a whole body scanner for automatic body dimension extraction and OCIE size prediction. A concurrent research effort was to implement the base foundation capabilities for the ARN systems for integration of this project into the Apparel Research Network (ARN) Supply Chain Management (SCM) initiatives.

A major focus of the project was to initiate and complete the pilot installation of ARN-IRM and the Human Solutions 3 Dimensional (3D) Whole Body scanning capabilities (VITUS/Smart hardware and ScanWorX software) for automatic issuing item size selection of OCIE at the CIF, Ft. Carson. The principal tasks of the project were:

- Requirements Analysis and Planning/Initial Site Assessment & Report;
- 3D Whole Body Scanner Installation and Size Prediction;
- ARN Systems Implementation, Integration & Training;
- GO-Live and Post Go Live Support; and,
- Project Management, Monthly Reports and Meetings.

1.2 Technical Approach

This project supported the development and validation of dynamic local tariffs. Using a combination of data from the Soldier Check-in process, as well as predicted sizes from the Human Solutions VITUS/Smart 3D Whole Body scanner, and final issue data from the issue scan forms, a fully integrated application was implemented to gather, organize, validate and eventually manipulate this data into dynamic customized local tariffs for OCIE.

At the CIF, Ft. Carson, AdvanTech expanded the automated data collection and entry technologies that had been successfully implemented at the five (5) U.S. Army Initial Issue Facilities, 2 United States Marine Corps Recruit Depots and the Air Force Clothing Initial Issue Flight.

The ARN-developed Integrated Retail Module (IRM) includes the automated data entry functions: issues, returns, exchanges, receipts, stock movements, physical inventory, requirements planning, and electronic document storage. Figure 1 below shows the integration and interaction of these functions.

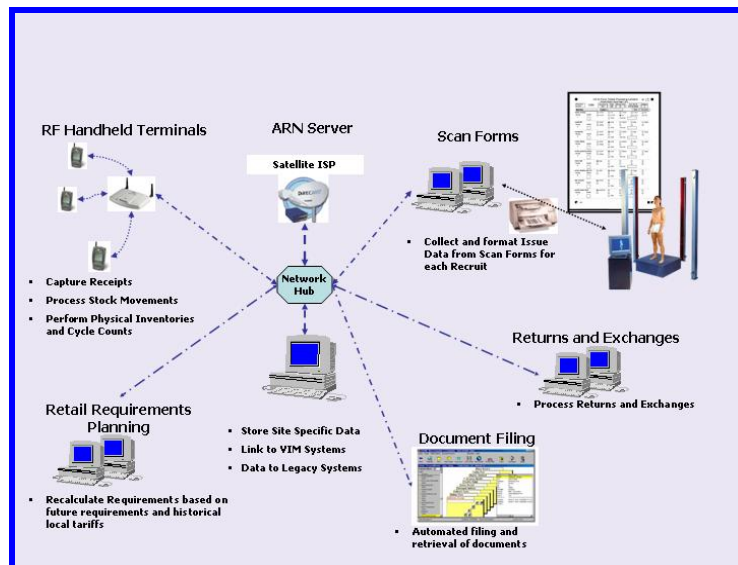


Figure 1 - ARN-IRM Integrated Components

The primary focus for Phase 1 of the ARN-IRM implementation at the Ft. Carson CIF as shown in Figure 2 was the inventory issue function. The scan form was set up in the IRM Control Panel to represent the OCIE items issued to Soldiers at the CIF, and to conform to the sequence of issues on the issue line. The electronic filing system was implemented for filing of all issue documents and the ARN consolidated issue record.

The 3D Whole Body Scanner is used to capture the physical body measurements of each soldier (initially for males only). These body measurements are then used to calculate predicted sizes that are incorporated into each soldier's customized scan form.

Scan forms detail the items each soldier receives based on their “Menu of items.” These Menus are normally specific to the type of assignment for each soldier. Scan forms were tailored to permit classifying of OCIE items as “new” versus “used.”

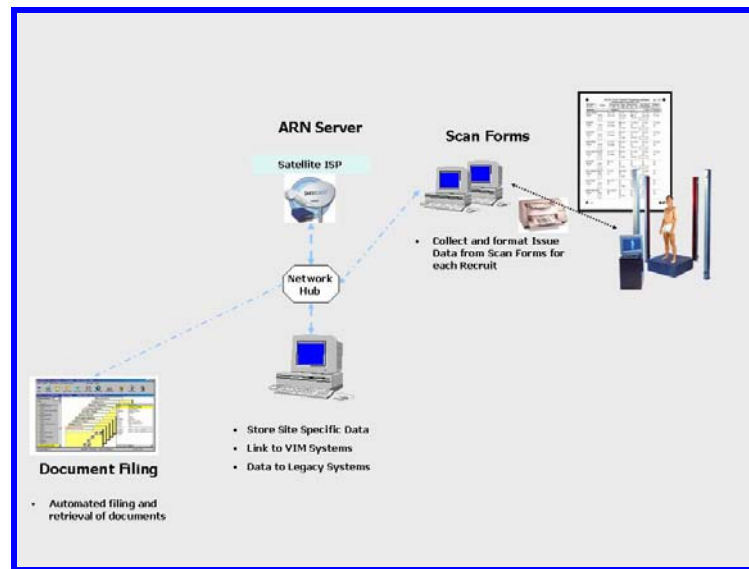


Figure 2 - Initial Fort Carson CIF ARN Components

The main goals of the ARN 3D scanning research initiative at the Ft. Carson CIF included:

- (1) Establish base-line information for future contracting and manufacture of uniforms;
- (2) Identify the correct uniform sizes required to reduce stock levels and increase efficiency; and,
- (3) Enhance operations and the effectiveness for the complete uniform supply chain and thus reduce costs in the overall process.

The main emphasis to-date in optimizing the military uniform supply chain has been research and evaluation of incorporating a whole body scanner for automatic body dimension extraction and uniform garment size prediction.

In recent years 3-D body scanners and 3-D body scan data have become available and used as a basis for the optimization of products and product development processes. The 3-D body scanning process uses the individual body as a basis for automatic body measurement extraction and automatic garment selection. Compared to traditional

body measurement, 3-D body scanning offers the opportunity to get much more complete and accurate measurement data about shapes and sizes.

This information can be used for automatic size selection and further advancement of size charts and optimization of pattern design for the US Army uniform garment items. Additional information, e.g., extended sets of body measurements and postural information or body shape, becomes immediately available with 3-D body scanning and can be used to beneficially support traditional body measurement statistics and garment size design. The benefits from application of 3-D body scanning for garments are visualized in Figure 3 - Body Scanning & Value Chain Relationships.

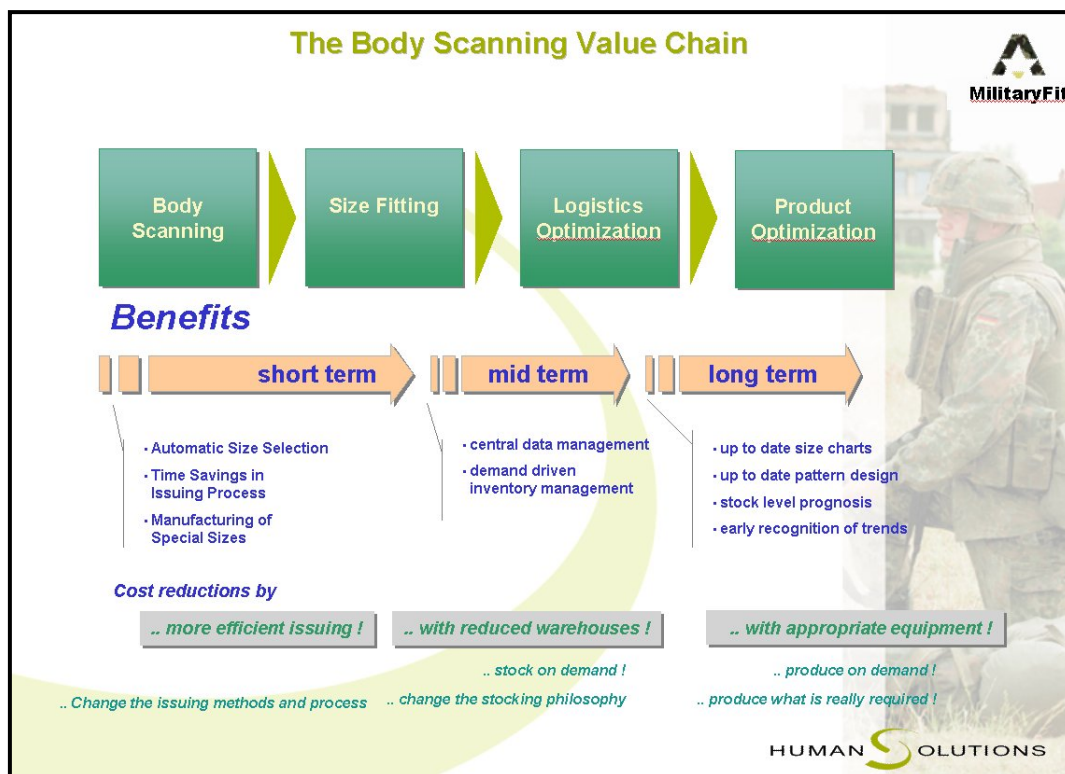


Figure 3 - Body Scanning & Value Chain Relationships

The anticipated benefits center on improving inventory accuracy, ease of use and faster processing of soldiers through the issue stations, faster and more efficient forms scanning, and incorporation of 3D Whole Body Scanner predicted sizes into the OCIE issue forms. These enhancements and technology integration have ensured that Soldier issues are accurately and quickly recorded, and combined with transfer of Property Book updates from ISM to ARN-IRM gives DSCP Item Managers better asset visibility and production requirements data.

Concurrent with other activities, handheld terminal (HHTs) devices were implemented with the ARN-IRM software capabilities, and are used to collect the receipt, stock

movement and physical inventory data. This data is transmitted wirelessly to the ARN server via strategically placed network access points.

Return, exchange and special issue processes were also implemented. These functions were implemented using a form that is generated based on what items the soldier currently has in his/her possession. By design, all exchanges must be within the same product category. Returns are processed for each soldier as they are preparing to leave the installation. These transactions are collected on the ARN Server.

The requirements planning function was enhanced to use the 3D Whole Body scanner and scan form data for calculating customized tariffs. Using current and future projections, the tariff is more effective in developing future supply requirements by size within each product category. The tariff is updated monthly. The ability to automatically capture the soldier's demographic data is an important part of this process. This data was obtained from each soldier's check-in data or through a periodic download from the appropriate U.S. Army legacy system(s).

ARN-IRM functions as a front-end data capture vehicle for this dynamic tariff. There was no automated interface between ARN-IRM and the U.S. Army legacy system, the Installation Support Module (ISM). Modernized ISM was developed during 2003 - 2005. It was implemented at Ft. Carson in September 2005. The joint effort between ARN and U.S. Army ISM project to create a database-to-database exchange of essential data between the two systems was initiated in March 2006, and a test of the interface was successfully conducted on 21 July 2006 at the Ft. Carson CIF.

The CIF staff scanned issue data from the issue scan forms into ARN-IRM and the issue data is then transferred directly to ISM to update the soldiers' Clothing Record. The issues interface was completed in XML (extensible mark-up language), and as issues are captured at the source by ARN-IRM they are automatically transferred to ISM.

1.3 Summary of Highlights/Results

The highlights and results can be split up between the outcomes resulting from installation of the 3D Whole Body Scanner and the outcomes from integrating the 3D Whole Body Scanner technology into the ARN-IRM system at Ft. Carson.

1.3.1 Scanner Installation & ARN-IRM System Integration at Ft. Carson

The project team worked with personnel at Ft. Carson to modify the Clothing Issue Facility operations with the incorporation of the 3D Whole Body scanner and the

integration to the ARN-IRM systems. Key elements of this activity are summarized as follows:

- Installed the Human Solutions VITUS/Smart hardware and software at Ft. Carson taking into account special requirements of the existing issue line and available floor space. The operational concepts and processes were developed to provide for integration of female soldiers into the whole body scanner process at a later time.
- Linked Human Solutions VITUS/Smart 3D Whole Body scanning capabilities to ARN Integrated Retail Module (ARN-IRM) information systems for soldier data captured by local personnel. This included linking data collection to ARN systems using scan forms and electronic filing software to capture issues at Ft. Carson. On that basis, recommendations were developed to integrate automatic uniform sizing results into the existing ARN SCM solution.
- Set-up and implemented an ARN Local Area Network (LAN). Provided interfaces for integration and linking of Human Solutions VITUS/Smart technologies into operational processes at Ft. Carson, and into ARN IRM Supply Chain Management (SCM) systems (outside the fire wall of Ft. Carson and existing 'legacy' systems).
- Developed and integrated the Merlin System as the interface software between ScanWorX and ARN-IRM for passing soldier information to ScanWorX and receiving the measurement extraction and size prediction information into ARN-IRM.
- Developed and implemented an exchange of essential data between CIF-ISM and ARN-IRM. The sharing of property book, menu, and clothing record data enables source data automation by ARN-IRM and transfer of issue data to update ISM on a real-time basis. The ARN R&D effort proved the concept of data exchange and provides ISM with an automated front-end that saves time in soldier issues and other transactions, and reduces the data handling workload of the staff at the Ft. Carson CIF.

1.3.2 Summary of Automatic Size Prediction at Ft. Carson

To implement an automatic size prediction for the 3D Whole Body Scanner technology the following steps and results were accomplished:

- Identified items to be integrated into the size prediction algorithms.

- Analyzed technical specifications and fit manuals in order to understand and consider fit-philosophy related to various items.
- Developed a size selection algorithm based on the technical specification in order to compare real fit data and fitting rates with theoretical rates.
- Conducted initial data collection, i.e., sample fit data and body dimensions that were used for a first size selection algorithm.
- Showed that an immense improvement in fitting rates could be achieved. The improvement was based on comparison between the size selection algorithm in the technical specification and the one based on the initial data collection. The results indicated that only a small percentage, a maximum of 25% of the issues, are made in accordance with the initial intent of the designers.
- Using the size prediction version based on the initial data collection, more body dimensions and fit data were sampled. Also, it was decided to include more items into the size prediction algorithms. Those items are referred to above as the “additional items.”
- The size prediction algorithms for items were optimized repeatedly and installed and tested at the issuing point until a final version was developed.
- Some items are issued for which there was not enough sample data during the course of the project. Therefore, no automatic size prediction algorithm could be developed for those items.

Table 1 lists all item issued in Ft. Carson split between single-sized and multi-sized items being predicted and multi-sized items not currently predicted.

Table 1: Items in Ft. Carson

Item Category	Total ARMY LINs
Single NSNs	132
Multi-Sized, Footwear	17
Multi-Sized, Gloves	13
Multi-Sized, Headwear	20
Multi-Sized, Sleep Systems	3
Multi-Sized, Womens	7
Multi-Sized, Predicted	35
Multi-Sized, Not Currently Predicted	62
Total	289

Table 2 lists the items initially included into the size prediction processing and items that were added later. This table also shows items with insufficient sample data available to create and evaluate a statistics-based fitting methodology.

Originally predicted items

PGC	NAME OF ITEM	SUFFICIENT N° OF SCANS
00399	TROUSER W/W	no
01736	TROUSERS C/W WDLD CAMO	no
01917	TROUSERS C/W ECWCS	yes
01918	PARKA C/W ECWCS	yes
01941	DRAWERS C/W POLY-PRO	yes
01942	UNDERSHIRT C/W POLY-PRO	yes
02146	COAT C/W DCU	no
02151	TROUSERS DCU	yes
02164	COAT CAMO ABDU DSRT	no
02362	PARKA W/W (RAINSUIT)	yes
02363	TROUSER W/W (RAINSUIT)	yes
02637	PARKA ECWCS DSRT	yes
02665	SHIRT C/W BLK FLEECE	no
02666	OVERALLS FLEECE BLK	no
02671	TROUSERS ECWCS DSRT	yes

Additionally predicted items

PGC	NAME OF ITEM	SUFFICIENT N° OF SCANS
00352	LINER, COLD WEATHER COAT	no
00356	LINER, COLD WEATHER TROUSERS	no
01755	BODY ARMOR, FRAGMENTATION PROTECT	yes
01772	OVERALLS, COMBAT VEHICLE CREWMEN'	no
01812	BODY ARMOR, FRAGMENTATION PROTECT	no
01928	OVERALLS, COLD WEATHER	no
02153	COAT, CAMOUFLAGE PATTERN	yes
02165	TROUSERS, CAMOUFLAGE PATTERN	no
02176	COVERALLS, COMBAT VEHICLE CREWMEN TAN	no
02204	TROUSERS, COMBAT	no
02205	COAT, COMBAT	no
02252	TROUSERS, CAMOUFLAGE PATTERN	no
02253	COAT, CAMOUFLAGE PATTERN	no
02259	JACKET, FLYER'S	no
02260	LINER, FLYER'S JACKET	no
02284	COVERALLS, COMBAT VEHICLE CREWMEN GRI	yes
02285	JACKET, COLD WEATHER	yes
02781	BALLISTIC ASSEMBLY, VEST, SMALL AR	yes
02809	DRAWERS, EXTREME COLD WEATHER	no
02812	UNDERSHIRT, EXTREME COLD WEATHER	no

Table 2: Items predicted

The information in the following table (see Table 3) summarizes the results achieved with the 3D body scanner. In the table below fitting rates are given for each dimension of the sizing system and the total, e.g., for a parka, the 1st size dimension is the chest girth, the 2nd size dimension the body height. The respectively percentage shows how good the fitting rule is to predict that size dimension. The total gives the resulting fitting rate for that item. Therefore, the row "Size Dim. 2" of single-sized items is empty.

Table 3 – Fitting Rates By Sizes

		UNDERSHIRT C/W POLY- PRO	DRAWERS C/W POLY- PRO	PARKA W/W (RAINSUIT)	TROUSER W/W (RAINSUIT)	TROUSERS C/W ECWCS	PARKA C/W ECWCS	PARKA ECWCS DSRT	TROUSERS DCU
Cases	Num Fit Assessments	777	773	783	784	2761	2780	138	118
Size Dim. 1	+/- 0	64,7%	65,5%	52,6%	68,9%	70,7%	70,1%	74,5%	83,1%
	+/- 1	97,9%	98,1%	95,3%	99,1%	99,8%	99,4%	99,3%	100,0%
	+/- 2	100,0%	100,0%	99,7%	99,6%	100,0%	100,0%	100,0%	100,0%
	> +/- 2	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Size Dim. 2	+/- 0					63,3%	79,5%	65,7%	70,3%
	+/- 1					94,5%	100,0%	95,6%	95,8%
	+/- 2					99,9%	100,0%	100,0%	100,0%
	> +/- 2					100,0%	100,0%	100,0%	100,0%
Total	+/- 0	64,7%	65,5%	52,6%	68,9%	56,0%	56,7%	60,6%	66,1%
	+/- 1	97,9%	98,1%	95,3%	99,1%	77,6%	92,5%	79,6%	86,4%
	+/- 2	100,0%	100,0%	99,7%	99,6%	94,6%	99,8%	94,9%	96,6%
	> +/- 2	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

		TROUSERS ECWCS DSRT	SHIRT C/W BLK FLEECE	OVERALLS FLEECE BLK	LINER, COLD WEATHER COAT	BODY ARMOR, FRAGMENTA TION PROTECT	OVERALLS, COMBAT VEHICLE CREWMEN	TROUSERS, COMBAT	COAT, COMBAT
Cases	Num Fit Assessments	137	1898	1881	450	178	16	13	12
Size Dim. 1	+/- 0	74,5%	63,6%	61,4%	75,6%	74,2%	68,8%	76,9%	75,0%
	+/- 1	99,3%	98,2%	94,1%	100,0%	98,3%	93,8%	100,0%	100,0%
	+/- 2	100,0%	99,8%	98,7%	100,0%	100,0%	100,0%	100,0%	100,0%
	> +/- 2	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Size Dim. 2	+/- 0	63,5%		83,0%	83,5%	84,3%	68,8%	69,2%	75,0%
	+/- 1	95,6%		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
	+/- 2	100,0%		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
	> +/- 2	100,0%		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Total	+/- 0	59,1%	63,6%	53,1%	75,6%	64,0%	62,5%	53,8%	58,3%
	+/- 1	78,8%	98,2%	86,9%	83,5%	92,7%	75,0%	92,3%	91,7%
	+/- 2	94,9%	99,8%	98,1%	100,0%	100,0%	93,8%	100,0%	100,0%
	> +/- 2	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

		JACKET, FLYER'S	LINER, FLYER'S JACKET	COVERALLS, COMBAT VEHICLE CREWMEN GREEN	JACKET, COLD WEATHER	COAT, CAMOUFLAG E PATTERN	BALLISTIC ASSEMBLY, VEST, SMALL AR	DRAWERS, EXTREME COLD WEATHER	UNDERSHIRT , EXTREME COLD WEATHER	Total Average
Cases	Num Fit Assessments	11	10	178	194	125	1272	757	565	475
Size Dim. 1	+/- 0	100,0%	50,0%	68,0%	74,2%	65,6%	64,4%	62,1%	49,9%	68,9%
	+/- 1	100,0%	100,0%	96,6%	99,0%	100,0%	98,6%	99,5%	99,3%	98,6%
	+/- 2	100,0%	100,0%	100,0%	100,0%	100,0%	99,8%	100,0%	100,0%	99,9%
	> +/- 2	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Size Dim. 2	+/- 0	81,8%	60,0%	60,1%	83,5%	46,4%		84,5%	92,7%	73,1%
	+/- 1	100,0%	100,0%	92,1%	99,5%	88,8%		100,0%	100,0%	97,9%
	+/- 2	100,0%	100,0%	100,0%	100,0%	100,0%		100,0%	100,0%	100,0%
	> +/- 2	100,0%	100,0%	100,0%	100,0%	100,0%		100,0%	100,0%	100,0%
Total	+/- 0	81,8%	20,0%	47,8%	68,6%	33,6%	64,4%	55,4%	47,3%	40,0%
	+/- 1	100,0%	90,0%	76,4%	89,2%	68,8%	98,6%	90,9%	95,0%	61,0%
	+/- 2	100,0%	100,0%	93,8%	99,0%	98,4%	99,8%	99,9%	99,6%	67,5%
	> +/- 2	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	68,6%

Finally, the question has been raised as to whether the achieved fitting rates can be improved, and if they can, by how much and with what additional effort. The short answer is: we believe that the fitting rates can be improved, but we do not know by how much.

There are two things that control the fitting rate accuracy: 1) the data collected and used to generate the fitting rules; and 2) the consensus on the definition of a correct fit. Each of these is defined further in the following paragraphs.

1) Data collected and used to generate the fitting rules:

There are some improvements to the data collection and issue flow that can be better controlled. Steps that should be taken include: a comparison of the physical inventory to the ISM data to ensure the inventory status is accurate; recording of stock-out situations; prediction of best alternative sizes; and, creating a database-to-database linkage between Human Solutions and the local systems.

The physical inventory comparison to the ISM data is important to determine if stock-outs are being accurately reported, and will help ensure proper re-ordering lead times are met.

Under the current system, if the recommended size is not in stock, it is automatically recorded as a 'miss.' However, this does not provide an accurate picture of system performance. The simplest way to deal with this is to not include stock outs in the accuracy reporting.

The prediction of a best alternative size will achieve a few results: in the event of a stock out, there will be another first-try size recommended so that the issue staff don't waste time thinking about what to give the soldier. If the first choice is

in stock but doesn't fit, it will be more likely that the second try will fit, and this will also provide more information for fine tuning the sizing algorithms.

The creation of a DB-DB linkage will allow Human Solutions to access the most current data on a daily basis, rather than rely on weekly spreadsheet generation by on-site AdvanTech staff. This will make it easier for Human Solutions to conduct analysis for fitting algorithm improvement.

(ii) Consensus on the definition of a correct fit:

The definition of a correct fit has – to date – been deemed to be outside the scope of the current project. Various issues such as fitter consistency or soldier preference, as well as variability of garments would need to be addressed, and it is not deemed currently viable for large-scale measurement. As an example of the improved performance from improved data collection, we reference another project.

Human Solution was a partner in the “Uniform system for Improved Tariff” program (USFIT). The objective of USFIT was to integrate 3D body scanning technology into the existing clothing sizing and issue process at selected Clothing and Issue Facilities of the U.S. Army (CIF), obtain 3D scans on every soldier in order to collect consistent and accurate measurements for each soldier, use these measurements to improve the accuracy of clothing size selection and to provide an improved tariff for procurement, and to use the 3D scans at a later date for relevant body size information. The data for setting up the size prediction rules were collected with help of trained fitters and clearly and objectively defined fit criteria. Those data resulted in direct hits of around 70% - 75%, for +/- 1 sizes around 80% – 95

1.3.3 Summary of Benefits Achieved with Use & Integration of 3D Scanning

The information in the following paragraphs summarizes the activities and benefits achieved with the use and integration of 3D scanning into operations:

- Implemented all components of the ARN IRM at Fort Carson including interface with the Human Solutions VITUS/Smart 3D Body Scanner. The VITUS/Smart 3D Body Scanner is capable of scanning both male and female soldiers.
- Implemented issue scan forms for various menus and modified those scan forms to capture “new” versus “used” items issued to the soldiers, and automatic update of the soldier clothing record, providing a faster and less error-prone approach to source data capture. Gained visibility of ARMY-

owned assets for both new and used organizational items managed at Fort Carson.

- Integrated the data from the soldier check-in process into ARN-IRM to create the desired demographic data that is then used as part of the development of a dynamic local tariff.
- Instituted new size prediction algorithms to guarantee a functional fit and uniform look of soldiers. Developed size selection tables for automatic prediction of garment size for organizational clothing items based on the body measurements extracted from the 3D Whole Body Scans.
- Repeatedly optimized the size prediction algorithms, and repeatedly installed updates at the issuing point until a final version was developed, demonstrating great improvement in fitting rates.
- Implemented an exchange of essential data between CIF-ISM and ARN-IRM.
- Optimized the Ft. Carson CIF operation by establishing automatic size prediction that supports demand driven supply chain management.
- Developed additional Virtual Item Manager (VIM) functionality to allow the end users to generate customized local tariff reports to include groupings by gender, MOS and current status (Active/Reserve/National Guard).
- Implemented the necessary integrated tools to better manage the organizational clothing assets at the CIF, Ft. Carson.
- Achieved a high acceptance of the system throughout the project by all logistics staff at the Ft. Carson CIF.

2.0 INTRODUCTION

The Fort Carson Central Issue Facility (CIF) located outside of Colorado Springs, Colorado maintains approximately \$25 million of organizational clothing items in their bulk warehouse and self-service issue store. The current legacy system, Installation Support Module (ISM), serves as the data entry point for all issue, exchange, return, receipt and disposal transactions. ISM also stores all official clothing records. At the start of this project CIF personnel manually entered all data into ISM.

The CIF at Fort Carson stocks approximately 225 different types of items known as Organization Clothing & Individual Equipment (OCIE). Of these, 119 of the items are

not sized. Of the remaining 107 multi-sized items, 10 are footwear. These remaining items include coats, trousers, headwear, gloves/mittens, body armor and other personal clothing items.

During site visits made to a number of CIF's and Fort Carson, it was apparent through discussions that the ARMY tariff was inadequate for future requirements planning, new product implementation and inventory management. In some cases, the CIF's had taken it upon themselves to manually develop and maintain local tariffs in spreadsheets.

Once the spreadsheets were developed, they were not updated on a timely basis. The spreadsheets could not generate more specific tariffs based on current demographics of the soldiers such as: current status (Active/Reserve), job category, or gender. Fort Carson did not maintain its own local tariffs. In instances where an Army "pushed issue" occurred, as with desert camouflage uniforms (DCUs), the CIF accepted the Army tariff. Acceptance of the Army tariff resulted in a large number of uniforms in sizes that could not be used, because of the anthropometric changes in soldiers since the last anthropometric survey was completed by the Army.

Another issue identified during site visits was that certain clothing items when turned in used technically were no longer the same size as was issued when new, as a result of shrinkage due to frequent laundering. When the used items were placed back on the shelf for reuse, they were placed with same size/new items. Soldiers who would normally take a 42 regular in new clothing would have to take a 44 regular in used clothing due to shrinkage. The use of this data distorts the local tariff, because it truly did not represent the soldier's correct size.

This Final Technical Report is being submitted to relate the development and validation of dynamic local tariffs. Using a combination of data from the soldier's Check-in process as well as predicted sizes from the Human Solutions VITUS/Smart 3D Whole Body Scanner and final issue data from the issue scan forms, the intent was to implant a fully integrated application to gather, organize, validate and eventually manipulate this data into dynamic customized local tariffs.

2.1 CIF Operations & Processing Before ARN Implementation

The major functional elements at the Ft. Carson CIF in Building 330 include Reception, Turn-in and Classification (including exchanges and changes in stock category), Issue, Warehousing, Receiving, and Property Book/Functional Administrator.

The Reception area is the first stop for individuals coming to the CIF. There they obtain paperwork that is used to satisfy the purpose of their visit to the CIF, be that issue, turn-

in or exchange. Prior to implementation of ARN-IRM, “Menus” were accessed in ISM for those individuals going to the Issue area.

The Menus identified the items that conform to a soldier’s MOS or unit requirement. The soldiers then went to the Issue stations to obtain their OCIE issue. Following the OCIE issue, individuals went to the Checkout counters where clerks checked the completeness of the issue, and manually entered data into ISM to create or update the official Clothing Record.

A comprehensive summary of the CIF operation is provided in Appendix D – Overview of CIF Operation, Ft. Carson, Colorado.

2.2 Information Systems

2.2.1 Installation Support Module (ISM)

ISM is the U. S. Army legacy system currently supporting all CIFs. Issues, Returns & Exchanges, Receipts, Menu Adjustments, Category Changes, and Inventory Counts are all entered manually, and determination of order quantities and order processing is completed manually. The data is transmitted immediately to the ISM Server at the local DOIM, and further transmitted to the ISM System at Ft. Huachuca on a near real time basis.

2.2.2 ARN-IRM & ISM Interface Requirements

A prototype interface between ARN-IRM and ISM was developed and tested so that source data from ARN-IRM can be automatically provided to ISM. The development effort created a database-to-database exchange of data between the two systems, which is discussed later in this report.

2.3 Project Approach

AdvanTech implemented ARN-IRM, concentrating on the issue functions and automating the data entry process for issue data. The AdvanTech, Inc. and Human Solutions of North America, Inc, project team accomplished the implementation of the VITUS/Smart 3D Whole Body Scanner and its integration with ARN-IRM at the CIF, Ft. Carson using techniques that were successful at the Clothing Initial Issue Point (CIIP), Fort Jackson, and investigating/researching approaches to meet the unique needs of a CIF that were not found at a CIIP.

2.4 Short Term Project (STP) Objectives

The purpose of the Short Term Project (STP) was to research the application of source data automation, in the form of ARN-IRM, and 3D Whole Body scanning technology to a CIF operation and the PGCs that constitute OCIE at the CIF. The main objectives of this ARN research initiative at the CIF, Ft. Carson were to:

- Implement all components of the ARN IRM at Fort Carson including interface with the Human Solutions VITUS/Smart 3D Body Scanner. The VITUS/Smart 3D Body Scanner will be capable of scanning both male and female soldiers.
- Develop and implement bi-directional linkage to ARMY legacy systems.
- Gain visibility of all ARMY-owned assets for both new and used organizational items managed at the Fort Carson CIF.
- Implement the scan forms for various menus and modify those scan forms to capture “new” versus “used” items issued to the soldiers.
- Develop size selection tables for automatic prediction of garment size for organizational clothing items based on the body measurements extracted from the 3D scans.
- Develop a recommended process to address and quantify the changes in garment sizes due to normal shrinkage during use.
- Develop additional Virtual Item Manager (VIM) functionality to allow the end users to generate customized local tariff reports to include groupings by gender, MOS and current status (Active/Reserve/National Guard).
- Integrate the data from the Soldier Check-in process into the IRM to create the desired demographic data to be used as part of the tariff development.
- Provide Fort Carson the necessary integrated tools to better manage their organizational clothing assets.

2.5 Scope of the Project

AdvanTech, Inc. and Human Solutions worked closely together as the Project Team to accomplish the following activities that comprised the scope of the project:

- **Initial Data Gathering and Assessment Report Generation.** The initial stage of the project was thorough data gathering and assessment followed by documentation of current functions as well as proposed or desired operational changes. During this process, the Project Team finalized the

list of items targeted for size prediction by the 3D Body Scanner. An assessment of the information system linkages to the ARMY legacy systems was made to determine the exact information these systems need. An Assessment Report and Implementation Plan were prepared.

- **Site Surveys to Determine the Network Architecture and Configuration.** A detailed site survey was performed to determine the size of the local network, configuration of wireless access points, and available high speed internet connection options. The site survey also included a review and evaluation of local operations and recommended changes to those operations in order to successfully incorporate the VITUS/Smart 3D scanning capabilities into routine operations. The results of this survey were included in the Assessment Report.
- **Installation of the Networking Hardware.** The computers, software, and wireless network components were ordered and hot-staged at AdvanTech, Inc., and shipped to the CIF for installation after the initial test. The Network Access Points (NAPs) and network switches were installed in the CIF. A wiring contractor ran cable from the NAPs/switches to the ARN-IRM Server. This included all appropriate equipment and software to link the 3D Whole Body scanner.
- **Installation of the VITUS/Smart 3D Body Scanning System.** Human Solutions installed of the VITUS/Smart 3D Whole Body scanner hardware and software system components, including the software required to predict Soldier sizes.
- **Development and Integration of Size Selection Tables.** Human Solutions developed size selection tables for a selected set of items issued at Fort Carson. This included initial data collection for development of the size selection tables, and validation and optimization of the size selection tables for the selected population of items.
- **Implement Automated Solution For Capturing All The Relevant Data.** AdvanTech Inc. implemented and integrated all the data capturing technologies as part of the IRM. This included the ability to classify all issues as either “new” or “used.”
- **User training.** User training and documentation (on-line and hard copy) was provided as part of the implementation and operation.
- **Post Go-Live Support.** AdvanTech, Inc. personnel provided on-going support and monitoring to ensure all data is being accurately processed in

a timely manner, and that system operation is consistent. This also included network administration and remote off-site backup during the term on the project.

3.0 IMPLEMENTATION ISSUES, SCHEDULE & PROJECT ACTIVITIES

The start date for the project at the Ft. Carson Central Issue Facility (CIF) Local Tariff Project was 1 June 2004.

The initial planning and coordination to start the project is summarized in the following table. The table outlines the implementation issues and timeframe agreed to by ARN and the principals at Ft. Carson.

ISSUE & PRIORITY	COORDINATION & RESPONSIBILITY	FUNDING &/OR MATERIALS	COMMENTS	ESTIMATED COMPLETION DATE
1. Network Cable	ARN	ARN	ARN Contractor.	Week 4 – 5
2. Hi Speed Telephone Line & ISP	Ft. Carson DOIM, & ARN	ARN	ARN will order the service.	1 week
3. Install Hardware	ARN	ARN		Week 6 - 8
4. Build ISM Prototype Interface	ARN & PEO-EIS & Army G4	ARN	Establish database to database data exchange.	Ongoing issue.
5. Build Scanner Room & Dressing Rooms	Ft. Carson	Ft. Carson	Work Order	Week 8 - 12
6. 3D Whole Body Scanner Installation & Furnishings	ARN	ARN	Install, test, and train.	Week 20-24
6.1 Size Selection	ARN	ARN	Setup and validation of size selection	Week 40-44
ARN-IRM Go-Live	ARN	ARN		Week 10 - 12
7. Train CIF on ARN-IRM HHTs, Scan Forms, & System Operation	ARN	ARN	Three separate training sessions	Week 10 – 16

ISSUE & PRIORITY	COORDINATION & RESPONSIBILITY	FUNDING &/OR MATERIALS	COMMENTS	ESTIMATED COMPLETION DATE
8. Paper, printer cartridges, & other consumables	Ft. Carson	Ft Carson		On-going
ARN-IRM & Scanner Integrated Go-Live	ARN	ARN		Week 20
9. 3D Whole Body Scanner Maintenance	DSCP	DSCP		
10. ARN-IRM Maintenance	Ft. Carson after ARN project ends; > 2 Years	Ft. Carson; after ARN project ends > 2 Years	Provide Cost estimate to Ft. Carson.	

Table 4 - Implementation Issues & Schedule

The following Gantt chart provides an overview of the time-line for all implementation activities during the project.

The site preparations and the installation of hardware and software was accomplished on schedule, and the integrated operation of ARN-IRM and the 3D Whole Body Scanner was initiated to produce scan forms, capture issues, and develop the dynamic local tariff.

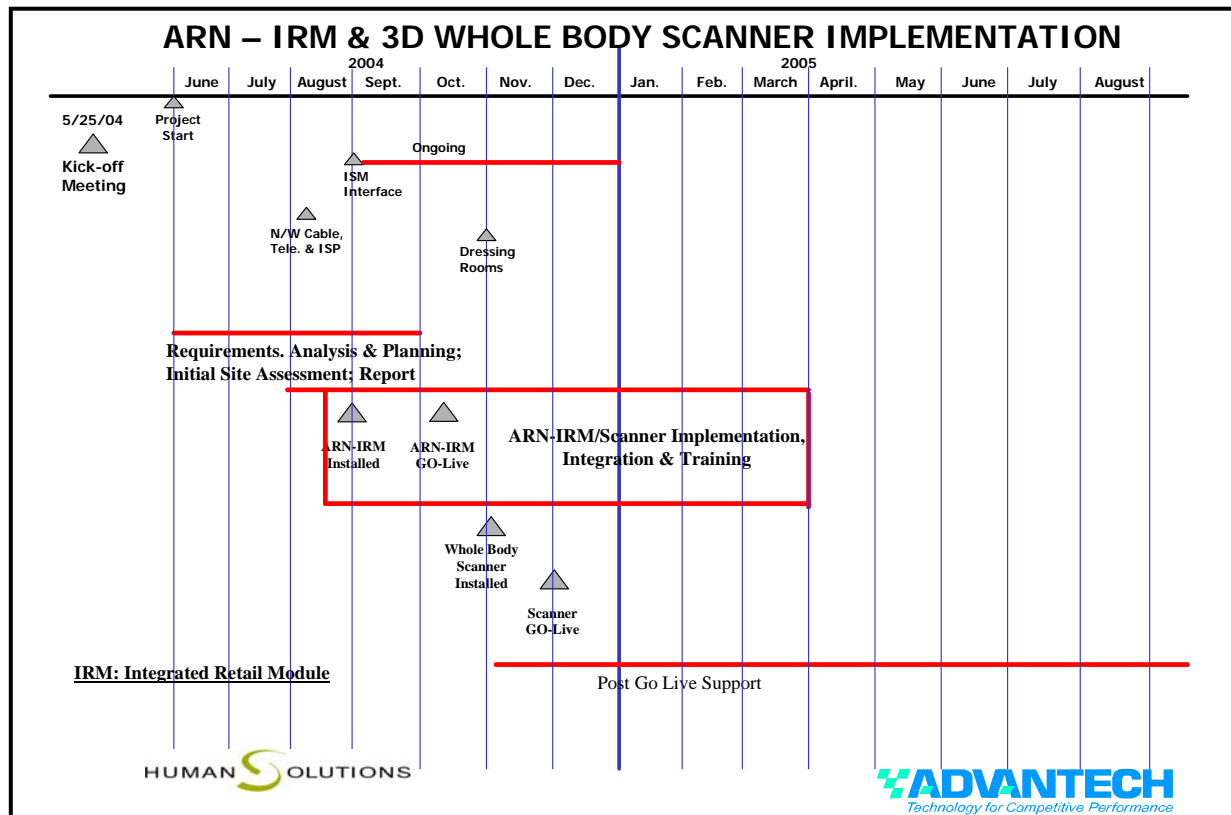


Figure 4 - Timeline

The overall project activities for this STP are summarized in this section. AdvanTech and Human Solutions worked closely together to accomplish the following activities.

3.1 The Initial Data Gathering and Assessment Report Generation

The initial stage was data gathering and assessment. This documented the current functions as well as proposed or desired operational changes. During this process, the list of items that the 3D Body Scanner would predict sizes for was finalized. There was also an assessment of the information system linkages to the ARMY legacy systems to determine the exact information these systems will need to obtain. The assessment detailed the final results and was recorded in the Implementation Plan.

3.2 Site Surveys to Determine the Network Architecture and Configuration

A detailed site survey was performed to determine the size of the local network, configuration of the wireless access points and available high speed internet connection options. The site survey also included a review and evaluation of local operations and

recommended changes to those operations in order to successfully incorporate the VITUS/Smart 3D scanning capabilities into routine operations.

3.3 Installation of the Networking Hardware

AvanTech assumed responsibility for ordering, hot-staging, network wiring, access point installation, operating system, and software installation of the ARN-LAN network. This includes all appropriate equipment and software to link to the 3D body scanner equipment.

3.4 Installation of the VITUS/Smart 3D Whole Body Scanning System

Human Solutions was responsible for installation of the VITUS/Smart body scanner hardware and software system components, including the software required to predict sizes for both male and female soldiers.

3.5 Development and Integration of Size Selection Tables

Human Solutions developed size selection tables for a selected set of items issued at Fort Carson. This included initial data collection for development of the size selection tables, and validation and optimization of the size selection tables for the selected population of items.

3.6 Implement Automated Solution for Capturing All the Relevant Data

AvanTech implemented and integrated all the data capturing technologies as part of the IRM. This included the ability to classify all issues as either “new” or “used.” Also all necessary manual data linkages to and from the ARMY legacy system was provided.

3.7 User Training

All user training and documentation (on-line and hard copy) was provided.

3.8 Post Go-Live support

AvanTech personnel provided on-going support and monitoring to ensure that data was being accurately processed in a timely manner. This also included network administration and remote off-site backup during the term of this STP.

4.0 ARN-IRM IMPLEMENTATION INFRASTRUCTURE

This section contains the essential elements for establishing the ARN – IRM at the Ft. Carson CIF and the relative order for the sequence of implementation activities. The elements were necessary to provide the capability for the CIF to capture the aforementioned data by automated processes and to build the local tariff database and share that data with ARMY. ARN-IRM and the 3D Whole Body Scanner were installed, integrated and made operational in the environment as illustrated in Appendix E – Floor Plan and Issue Process at CIF, Ft. Carson.

4.1 Establish ARN Local Area Network

A Local Area Network (LAN) was established to control and connect all functionalities of the Integrated Retail Module (IRM) System at the Ft. Carson CIF. The ARN Local Area Network was connected to the ARN Single Server via the Virtual Private Network (VPN) protocols that are now available as part of the Windows 2000 operating system. FTP protocols and PCAnywhere are being used as back-ups for the VPN for remote connectivity for any troubleshooting, help, and administrative support requirements.

4.1.1 Network Requirements

The ARN Integrated Retail Module (ARN-IRM) software package was installed on systems outside of the primary Ft. Carson secure network. This necessitated the setup of a small local area network dedicated to support of the ARN initiative at Ft. Carson. This network connected the various workstations and other hardware used in inventory control and the wireless hand held terminal HHT systems.

AdvanTech, Inc. installed and maintained this network. The local area network uses industry-standard 100-Base-T Ethernet interfaces and connects to the Internet via an Integrated Services Digital Network (ISDN) line to a commercial Internet Service Provider (ISP). A firewall system is employed to protect the local area network from unauthorized intrusion or disruption. The data flows out to ARN Asset Visibility System (AAVS) and other databases over the Internet, and AdvanTech had remote VPN access to the local area network for administration and troubleshooting purposes.

4.1.2 Overarching Architecture

The detailed diagram in Figure 5 below shows the architecture of the data flows within the ARN Network, and the use of HHTs for bidirectional wireless communication from

various locations in the CIF with NAPs located on the walls and ceilings of the CIF. The NAPs provide bidirectional wireless transmission with the Network Hub, which in turn are wired to the ARN Server. The latter is connected via a high speed router to the Internet for communication with the ARN Single Server and the ARN Asset Visibility System (AAVS).

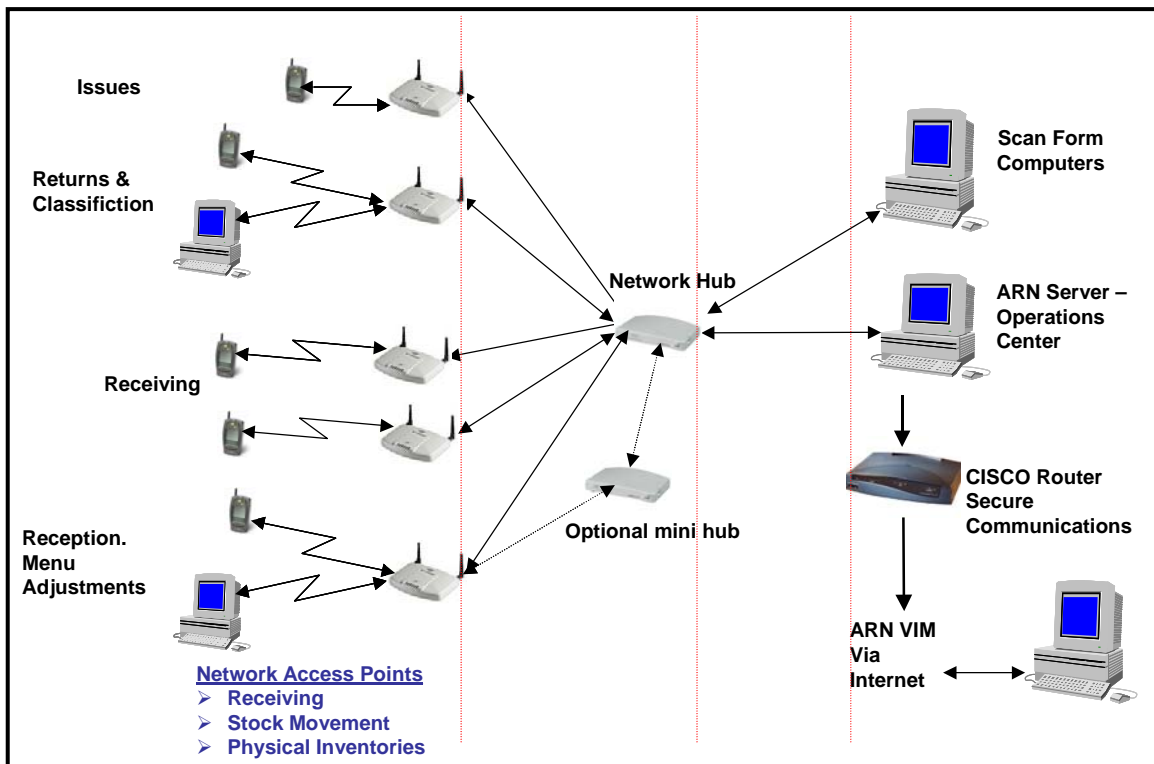


Figure 5 - ARN Network Data Flow Architecture

The following Figure 6 and Table 2, below, CIF Network Configuration, identify and illustrate the exact locations of the network components within the CIF in relation to the ARN Server at the Reception Area, the 3D Whole Body Scanner, the issue area, the warehouse, and the checkout stations.

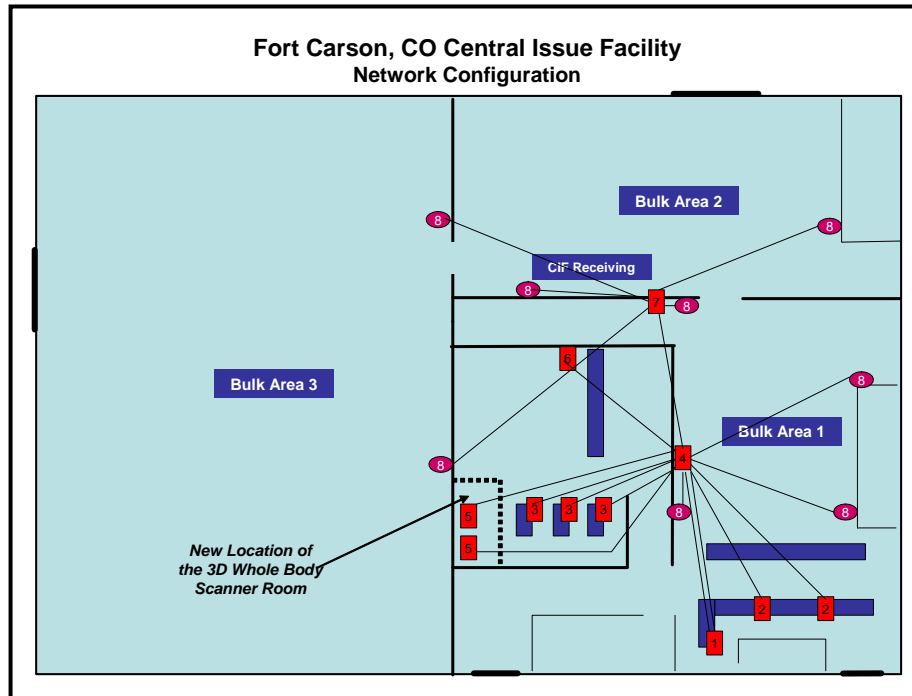


Figure 6 - CIF Network Configuration

Fort Carson, CO Central Issue Facility Network Configuration			
Symbol	Description	Ethernet Cables	Electric Outlets
1	Proposed Server Location and Network Router (2 Cables)	2	2
2	Work Stations – Check In Area (1 Cable for Each Work Station)	2	2
3	Work Stations with Form Scanner – Check Out Area (1 Cable for Each Work Station)	3	3
4	24 Port Network Switch		1
5	3D Body Scanner Computers (1 Cable for Each Work Station)	2	2
6	Printer Station Location for Scan Form generation (1 Cable)	1	1
7	12 Port Network Switch	1	1
8	Wireless Network Access Points	8	8
		19	20

Table 5 - CIF Network Configuration

4.1.3 Communications and Internet Service Provider

Communications with the ARN LAN is required to establish the VPN link and to perform system administrator functions. From lessons learned at other ARN sites, standard telephone dial-up service linkage has proven unreliable and too slow to support large data transfers and to perform system administration functions. High speed Internet service was set up with Charter Communications, Colorado Springs, CO, to establish reliable communications and connectivity.

4.2 ARN-IRM System Implementation and Functionality

4.2.1 Overview

The ARN-IRM Internet Based system was installed to provide the CIF users with an on-line, real-time integrated application that provides current stock position almost immediately (near real-time) after the transactions (Receipts, Issues and Adjustments) are transmitted. The system was prepared and installed as follows:

- AdvanTech, Inc. hot-staged all components at its offices, then shipped the ARN Server, workstations and other hardware (UPS, printers) and the Internet hub to the CIF on 17 August 2004 and set them up on 18 August 2004. The ARN Server was installed at the Reception Desk area, and the workstations were installed at the issue checkout points, and at the site of 3DWhole Body Scanner.
- AdvanTech, Inc. contracted for and completed the cabling for the Wireless Network within the CIF, installation of the Network Access Points (NAPs), and provision of electric power for the NAPs and the all the other power requirements associated with the ARN components and the 3D Whole Body Scanner.
- AdvanTech, Inc. contracted for and installed high speed Internet service from Charter Communications. The latter ran new cable to the CIF, Building 330. AdvanTech, Inc. installed the Cable Modem, connected it to the ARN Server and obtained full Internet service.
- The NAPs became operational August 2004 permitting communication with the ARN Server and the Internet from remote areas in the CIF. The ARN Server was configured by Advantech, Inc. and was connected back to the AdvanTech offices in Annapolis, MD.

- Menus were obtained from ISM, updated, and are being maintained current with ISM in ARN IRM. The ISM stock catalog was obtained by query and the information was reformatted to be able to link with the numbers in the Menus. The LINs were obtained from the Stock Catalog and were matched to the Issue Points so the scan form can be set up in proper sequence. A table was created to match MOSs to particular Menus so ARN-IRM can do the matching.
- Scan form development was completed for the items to be issued to soldiers and was integrated into the ARN-IRM Control Panel.
- In September 2004 AdvanTech, Inc. and Human Solutions surveyed requirements to complete the modification of the raised ceiling in the 3D Whole Body Scanner area and based on the time to complete the modifications, AdvanTech, Inc. initiated the scheduling of the network and electrical contractors to complete the facility prior to installation of the Scanner.
- AdvanTech, Inc. hired and in-processed a Customer Service Engineer (CSE) for operational support of ARN-IRM and support to the CIF personnel using the system. The new CSE was introduced and oriented to the CIF, duties were assigned, and he was oriented to ARN-IRM, the SQL tables, the network layout, and the OCIE Check-In program. He immediately began his support role.
- The AdvanTech, Inc. staff established the ARN-IRM check-in process, oriented the CIF Reception personnel to the ARN-IRM menu selection and check-in process, simulated the process, and introduced all concerned to the scan forms and the how the issue data will be recorded from the scan forms into ISM and ARN-IRM.
- The GO-Live and Post Go Live Support period started on 4 November 2004 one day in advance of General Mongeon's visit on 5 November 2004. AdvanTech, Inc. and Human Solutions made preparations for the visit by establishing the initial integration, and demonstrating the scanning of soldiers, prediction of sizes, and issue of OCIE using the issue scan forms. Human Solutions prepared a demonstration to show the extraction of the body dimensions and the size fitting.
- During December 2004, AdvanTech, Inc. and Human Solutions concentrated on synchronization between the ScanWorX software and ARN VIM-IRM. The synchronization was completed and scanning of soldiers continued throughout the month.

4.2.2 Implementation

Access to ARN-IRM was made available through four workstations attached to the ARN LAN server with appropriate log-ins and passwords. Two workstations were located next to the ARN Server at the Ft. Carson CIF Reception Area and constituted the primary access to the ARN-IRM.

4.3 ARN-IRM OCIE Data Flow

4.3.1 OCIE Data Flow

The diagram below shows the overall ARN-IRM dataflow implemented by ARN to provide a local tariff to the Army Database through source data automation of issues, receipts, returns & exchanges, stock category changes, and inventory counts. The dataflow, with minor exceptions, had been prototyped and implemented at three recruit training centers.

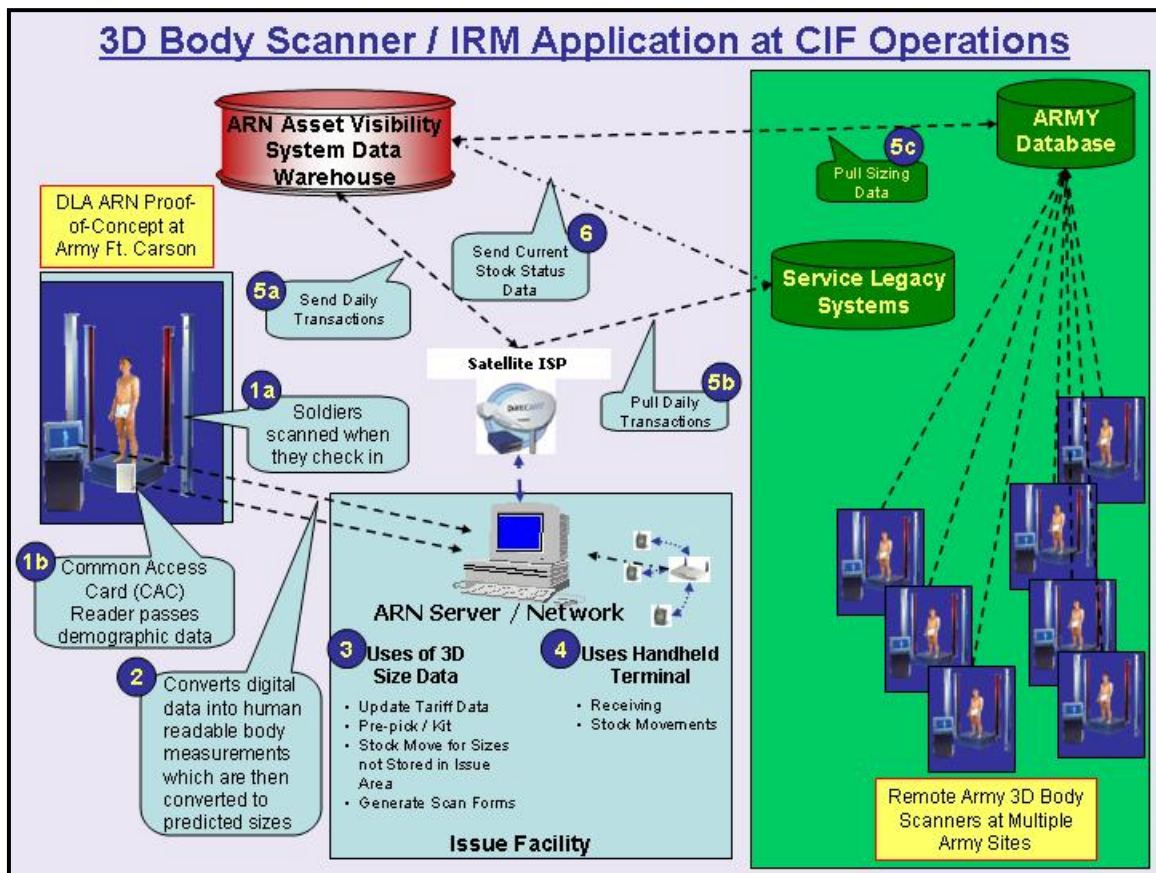


Figure 7 - ARN IRM OCIE Data Flow

4.3.2 OCIE Issues Dataflow

The issue dataflow for OCIE is essentially the same as the issue dataflow for recruits and is detailed here, as implemented at the Ft. Carson CIF, and illustrated in Appendix E – Floor Plan and Issue Process at CIF, Ft. Carson.

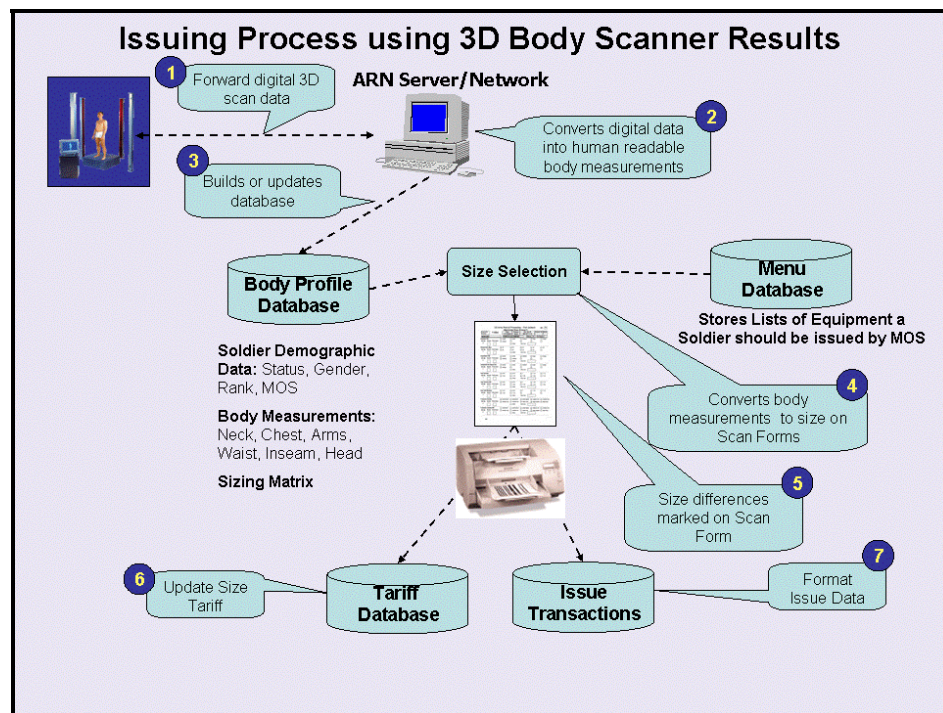


Figure 8 - ARN/IRM Issuing Process Flow

4.3.3 Reception and Initiation of Issue Process

The management of the issue process and capture of issue data was completely automated, from the time the soldier arrives at Reception until the soldier departs with his issue through the checkout counters.

Soldier identification data (SSN, unit), existing ISM Clothing Records for Ft. Carson soldiers, and basic “menus” are obtained from ISM and placed in ARN-IRM on a scheduled basis. The foregoing data is accessed through an ARN workstation at the Reception Desk when a soldier arrives for an issue. Reception selects a “menu” for individual soldiers, based on their UIC/MOS. Depending on the status of the soldier, one of the following occurs:

- Full Issue: create an Issue record for the soldier if necessary, select menu for soldier's new unit, and process as a full issue of OCIE.
- Intra-Post Transfer: create an Issue record for the soldier if necessary or access Issue record in ARN-IRM, select menu for soldier's new unit, transfer "carry forwards" from old record, replace old record, and identify partial issue if any.
- Inter-post transfer: create an Issue record for the soldier if necessary. The soldier may or may not have paper showing "Carry Forward" items. If paper is available Reception accepts "Carry Forward" figures and enters in the new Ft. Carson Issue record in ARN-IRM for the individual.

In instances when the 3D Whole Body Scanner is not used (initially female soldiers were not scanned) the menu to be issued may be immediately transmitted to the ARN printer at Issue Station #1. The menu of items is printed out as a Scan Form and is ready for the soldier upon arrival at Issue Station #1. The items on the Scan Form are in sequence with the Issue Stations. As the items are issued the size of each sized item is written on the form.

For all male soldiers the 3D Whole Body Scanner is in the operational sequence. The identification data is transmitted from Reception to the workstation at the 3D Whole Body Scanner. The identification data is selected as the soldier enters the Scanner. The whole body scan is completed and a Scan Form is printed out with predicted sizes for each sized item on the menu. Additionally, a range of sizes around the predicted size is provided on the Scan Form. Again, the items on the Scan Form are in sequence with the Issue Stations. As the items are issued the size of each sized item is checked off on the form or, if necessary, written in.

At the completion of the OCIE issue, the soldier proceeds with the Scan Form and the issued items to the Checkout Counters. At this location the items are checked with the soldier to ensure correct quantity and size. An ARN forms scanner then scans the Scan Form and the issue data is transferred immediately to the ARN Issue record for the soldier. The issue data is then immediately available for forwarding to ISM.

The issue data, for the below listed PGCs in Chart 4, in addition to being the basis for replenishment actions is also the basis for the creation of the local tariff for the Ft. Carson CIF, which may then also become of a part of the ARMY tariff database.

PGC	Item	Gender	No.Sizes
02083	trousers, men's	male	42
02442	coveralls, flyers'	male	28
02153	coat, camouflage pat	male	22
02151	trousers, camouflage	male	21
02253	coat, enhanced hwbd	male	20
02252	trousers, enhanced hwbd	male	19
02146	coat, cold weather	male	18
01917	trousers, cold weath	male	17
01918	parka, cold weather	male	17
02194	coveralls, flyers'	male	17
02637	parka, extreme cold weather	male	17
02671	trousers, cold weather	male	17
02284	coverall, cvc og	male	15
02285	jacket, cvc og	male	15
02378	coat, combat	male	15
02379	trousers, combat	male	15
00616	jacket, flyer's	male	14
01772	overalls, combat veh	male	14
02159	cap, camouflage pattern	male	14
02204	trousers, combat	male	14
02205	coat, combat	male	14
02259	jacket, flyer's	male	13
02260	liner, flyer's jacket	male	13
01863	coat, camouflage pat	male	12
01736	trousers, cold weath	male	11
01755	body armor, fragment	male	10
01928	overalls, cold weather	male	10
00352	liner, cold weather	male	8
00356	liner, cold weather	male	8
01812	body armor frag xxi	male	8
01820	suit chemical prote	male	8
01862	trousers, camouflage	male	8
02781	body armor outer	male	8
01775	trousers, camouflage	male	7

Table 6 - PGCs 3D Whole Body Scanning

AdvanTech, Inc. downloaded approximately 1.1 million clothing records from the U. S. Army Integrated Support Module (ISM). As units and soldiers, that already have their OCIE Issue, are scanned, the scan will be matched to the clothing record file to obtain the actual sizes issued and will be used for 3D Whole Body scan validation.

As part of system optimization, AdvanTech, Inc. standardized the CIF issue function on the actual size codes as shipped by DSCP, and as used in ARN-IRM, and cross-referenced the same to the non-standard size codes used in ISM. This work simplification step freed the CIF staff from having to memorize the ISM size codes, and one issue form is now used instead of two; the same issue form is used at checkout for scanning issues into IRM followed by data entry into ISM prior to completion of the automated interface. The AdvanTech, Inc. Customer Service Engineer (CSE) trained the CIF person, at the checkout desk, to scan the forms, in addition to their usual ISM data entry function.

AdvanTech revised the format of the Issue Receipts. The Issue Receipts were created after the Issue Forms were scanned in at the Check-Out desk. Now the Issue Receipts are scannable, and are being stored in the electronic filing system. Previously, the Issue Forms, which were 3-5 pages for each soldier, were stored in the electronic filing system. Now just the Issue Receipt (with the soldier's signature) is being stored (which is only 1-2 pages per soldier). The CIF staff was extremely pleased with this work simplification effort, and the opportunity to reduce the steps necessary to complete the issuing process and to maintain an official issue receipt electronically.

4.3.4 OCIE Menu Adjustments

Menus were obtained from ISM, updated, and are being maintained current with ISM in ARN IRM. The ISM stock catalog was obtained by query and the information was reformatted to be able to link with the numbers in the Menus.

The LINs were obtained from the Stock Catalog and were matched to the Issue Points so the scan form can be set up in proper sequence. A table was created to match MOSs to particular Menus so ARN-IRM can do the matching.

Updated Menus are critical to the issue process and must be current between IRM and ISM prior to soldiers arriving at the Reception Desk to pick up their issue forms.

4.3.5 OCIE Receipts

AdvanTech, Inc. staged and tested Hand Held Terminals for the scanning of bar-coded warehouse locations and bar-coded labels prior to implementation of automated inventory and automated receiving, respectively, in the months to follow. The receiving function was implemented with hand-held terminals. Additionally, warehouse locations were bar-coded and integrated into the locator system.

The CSE set up IRM and the hand held terminals (HHTs) used in the CIF Receiving Section to scan bar code labels and receive stock into IRM inventory. Individuals in the

Receiving Section were trained to operate the HHTs. IRM produces a form, showing the receipts, that CIF Staff can use to enter the receipts into ISM prior to completion of the automated interface.

4.3.6 OCIE Category Changes

The process for accomplishing category changes was patterned after the design and procedures used for comparable installations.

4.3.7 OCIE Inventory Counts

The procedures used for completing inventory counts was patterned after the design and procedures used for comparable installations. This includes the provisions for selecting blocks of items to be inventoried, cycle count capabilities and multiple checks to ensure accuracy of any resulting inventory counts.

4.4 Radio Frequency Networking of Inventory Data

4.4.1 Overview

Wireless and handheld terminals were installed to automate the functions of receiving, stock transfers and inventory counts.

4.4.2 Data Flow

Receipt data, stock movement data and physical inventory data are transmitted from the handheld terminals to the ARN/Local server (see diagram below).

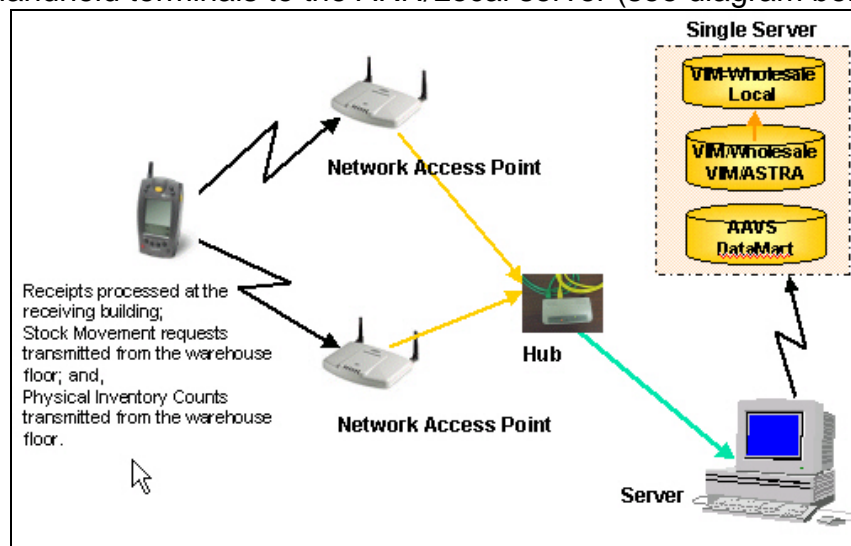


Figure 9 - Wireless HHT Data Flow

4.5 Integration of Scan Forms

The Scan application was implemented to capture detailed issue data for Defense Supply Center, Philadelphia. The Scan application is used to capture issues made to soldiers at the Ft. Carson CIF.

In order to accurately capture the issue data and subsequently decrement stock levels, the Scan application is programmed to track issues made to soldiers by capturing the name, social security number (encrypted to ensure individual privacy), unit, stock number, quantity issued and date issued as an individual issue file. This data is used to decrement each line item of supply issued to a particular soldier on a specific day and thus provide an audit trail of transactions.

4.6 Electronic Document Management System

To provide an efficient manner in which to manage and retrieve (if necessary) the issue forms, AdvanTech integrated a commercial-off-the-shelf software (COTS) document management system. This application electronically stores the scanned image of each trainee's issue form. This provides an easy and efficient method of searching for and retrieving any specific data needed for verification or correction. The data can then be easily archived or deleted as applicable. Key activities supporting the establishment of the document management system included the following:

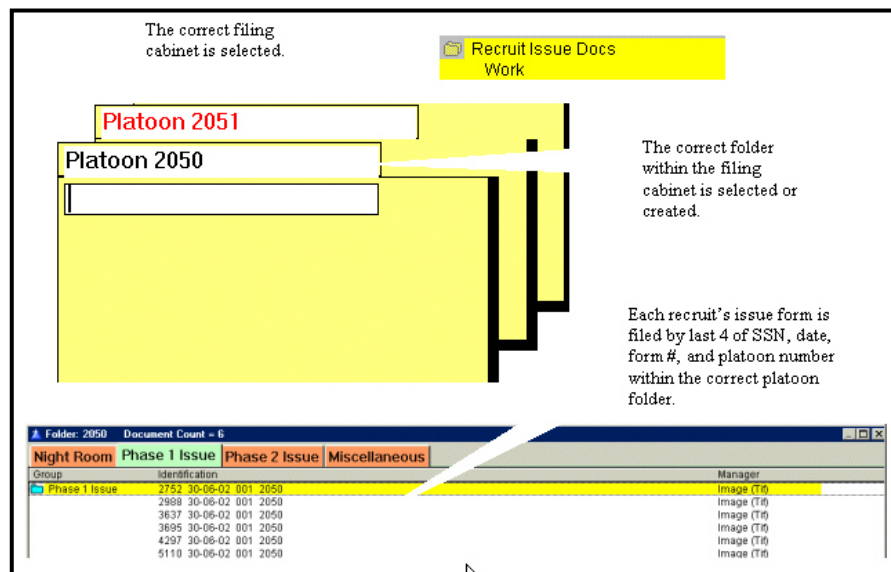


Figure 10 - Electronic Filing Cabinet for Completed Scan Forms Storage

(Note: Sample is based on USMC Implementation and will be adapted for CIF implementation, e.g., Soldier v. Recruit, and Unit v. Platoon.)

- A new version of the electronic document management system and the autofile feature were implemented for the issue forms, which permits automated filing. The new SQL version was loaded to the CIF-Store2 machine.
- Obtained a Unit Table to use for showing unit name on the issue form, and added maintenance of Unit Table to the Control Panel. Imported the UIC_Unit Table to IRMSQL database for use to show the UIC on the issue form.
- AdvanTech's Customer Service Engineer trained Ft. Carson personnel to scan current individual Clothing Records into the new electronic document management system, gradually eliminating paper, manual filing, and filing cabinets. The electronic document management system creates (corresponds to current ISM Issues), folders 000 – 999 to accept scanned documents based on 1st three of the soldier's SSN.
- Current green-bar paper clothing records, printed from ISM, were too light to scan and read. In lieu of using the ISM printouts, as soldiers come in for any DX or issue, CIF personnel will pull the soldier's folder, reprint the clothing record on the laser printer, and have it signed. Then CIF

personnel scan the new, signed, laser printed clothing record into the proper folder. A DVD writer has been acquired for backing up the data.

- Staged and installed additional high speed printers and forms scanners in preparation for the switch from the old print-out paper produced by the ISM legacy system to 8" x 11 ½" paper and forms that can be read and scanned into the database. Additionally, the equipment will be used to print out and scan clothing records that are currently occupying approximately fourteen (14) filing cabinets. The records will be scanned into the electronic filing system, and the filing cabinets will be removed.

4.7 Ft. Carson CIF Roles and Responsibilities

The key roles and responsibilities of the CIF personnel are to maintain operation of the ARN Integrated Retail Module and the related local (wholesale local) inventory management capabilities as defined in the DSCP and Ft. Carson CIF Memorandum of Agreement (MOA).

One of the key steps in the integrated processing of the soldiers is for the CIF to obtain timely and accurate provision of Menus from ISM. This information is used to prepare the Scan Forms that are subsequently used to record the Soldier issues.

System operation and inventory management responsibilities – including policies and procedures – were thoroughly covered during system implementation, training and post go-live support activities.

4.8 Training and Support

Prior to go-live, training was conducted for key personnel on the various components of the system. Key personnel were identified by name in coordination with the CIF supervisor. Training was primarily hands-on, one on one instruction.

4.9 Follow-On Training and Help Desk Support

At approximately six weeks after go-live a follow-on one-week training visit was scheduled and refresher training was given in all areas.

After go-live, CIF personnel utilized the QLM Help Desk, by telephone or email, to request assistance.

Onsite support was provided for the first DSCP directed semi-annual inventory after go-live.

4.10 Customer Services Engineer (CSE)

A Customer Services Engineer (CSE) was hired by AdvanTech, Inc. to operate the 3D Whole Body Scanner and to provide daily systems support to the CIF.

The Table below shows the basic workflow of a normal workday for the CSE and is a high level overview of the issue process.

Time	Function
0730	Begin to scan male soldiers using the 3D Whole Body Scanner.
1100	Scanning should be completed.
1110	Begin to process ARN-IRM scan forms.
1230	Scan forms should be completed.
1300	Complete scan forms if necessary and begin the check-in process for the Next day's soldiers.
1600	End the check-in process for the Next day's soldiers

4.10.1 Other CSE Responsibilities.

In the event the 3D Body scanner is not operational, the Customer Service Engineer will make sure the IRM scan forms are printed and ready for use. In the event the Customer Service Engineer is not working, AdvanTech personnel will be able to remotely generate the blank forms. Other CSE functions:

- Menu Revisions
- Catalog Revisions
- Monthly Reports
- Hardware And Network maintenance
- User training on how to properly fill out a scan form
- Assist in the check out process including data entry into ISM
- Design and Development of Tablet-based Exchange and Turn-in Process

4.10.2 CSE Performance

CSE performance is monitored on a daily and monthly basis through:

- Use of the daily Transaction Logs;
- A Sign-in and Sign-out function as part of the Advantech Timesheet System; and,
- Use of statistics comparing number of issues in ISM vs. number of issues in ARN-IRM.

4.11 ARN-IRM to CIF-ISM Interface Development

In March 2006 ARMY and DLA ARN/CDUM agreed to pursue a pilot program at the Central Issue Facility, Ft Carson, CO that starts with 3D Whole Body scanning and ends with integration of the ARMY Installation Support Module (ISM) system with the ARN Integrated Retail Module (IRM).

The focus of the pilot was to use IRM for source data automation, capturing issues and other source data of the CIF and directly feeding data to CIF-ISM, and CIF-ISM would be the system of record. Using IRM to provide front-end source data automation to ISM saves time during soldier issues, and decreases the CIF workload. Additionally, once the issue interface was successful and proven using XML, the database to database interface, SQL to Oracle will be completed and the interface will be extended to other data that is manually entered into ISM, including, receipts, turn-ins & exchanges, and inventory status.

AdvanTech, Inc. and SRA Corporation collaborated on the essentials of such an interface. In order to minimize potential IRM/ISM data discrepancy, the companies resolved that the daily operating procedure would include three basic steps:

- (1) IRM downloads from ISM, prior to the starting of any daily ARN/CDUM issue process;
- (2) Upload of IRM data within the same business day, prior to next ISM data changes; and,
- (3) Make ISM data changes: menus and other changes that would cause potential ISM/IRM mismatch, after the previous IRM upload and before the next daily IRM downloads.

Implementation of the Modernized ISM was initiated at the Ft. Carson CIF during July 2005. The implementation paved the way for the U. S. Army ISM Project and ARN – IRM to proceed to collaborate on the development of an interface between ISM and IRM. As a result of the implementation AdvanTech, Inc. initiated a change in Line Item Numbers (LINs) in IRM to be compatible with the new LINs in ISM. At the moment that the interface to the Modernized ISM is operational, ARN-IRM will be ready to transfer issue data to ISM in compliance with the new LIN requirement.

4.11.1 ARN-IRM to CIF-ISM Interface Milestones

Table 7, below, Project Initiation & Completion Summary – Primary Milestones, summarizes the implementation issues & schedule that was established by ARMY and ARN for the pilot interface between Modernized ISMs and ARN-IRM at the Ft. Carson

Central Issue Facility (CIF). The table outlines the key milestones for the ARN pilot project at Ft Carson.

Item	PROJECT ACTION ITEMS	ACTION PARTY	PROJECTED TARGET DATES	COMMENTS	COMPLETION DATE
1-1	Apparel Research Network MIPR Funds to Army.	DLA	3/09/06	Status: complete.	3/09/06
1-2	Implement Revised 3D Whole Body Scanning Procedure per Memorandum Of Understanding.	CIF, Ft. Carson	TBD		
1-3	SRA Placed Under Contract to Perform Programming Work.	Army	3/20/06		
1-4	SRA System Development and Initial Testing Complete.	SRA	5/31/06	Implement New ISM: 7/06	Implement Interface: 7/06
1-5	Go-Live: Scanning Forms, Exchanging Data, and Synchronizing Databases.	CIF, Ft. Carson	9/06		
1-6	On-going Scanning Pilot and Progress Review.	All Parties	Item 1-5 + 6 months		

Table 7 - Project Initiation & Completion Summary – Primary Milestones

4.11.2 ARN-IRM to CIF-ISM Interface Timeline

Figure 10, below, IRM/ISM Interface Proof of Concept Pilot Timeline, was developed to guide the project and illustrates the timeline for the development of the interface. The proof of concept demonstration was successfully conducted on July 21, 2006. Proof of Concept Demonstration continued as IRM acquired source data and transferred the data to CIF-ISM.

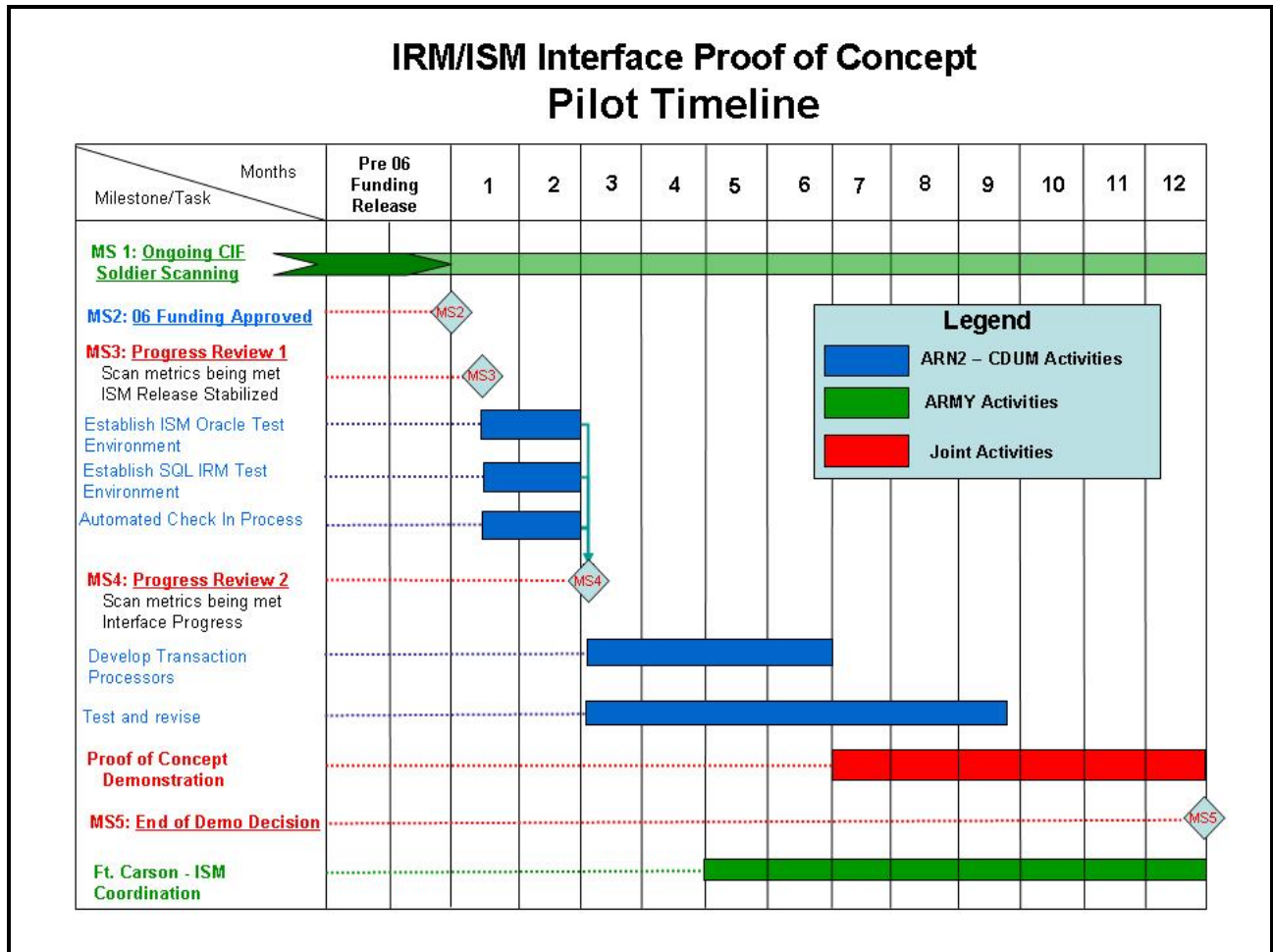


Figure 11 - IRM/ISM Interface Proof of Concept Pilot Timeline

4.11.3 ARN-IRM to CIF-ISM Interface Requirements

With these basic steps in place, ARMY, and its contractor SRA Corporation, and ARN, and its contractor AdvanTech, Inc. agreed to the interface requirements as shown in Appendix F – Modernized CIF-ISM and ARN-IRM Interface Requirements.

The flowchart, in Figure 12, Ft. Carson IRM/ISM Integration Process Data Flow, describes the process flow established for the integrated data flow between IRM and ISM. The top level describes the 4 categories of how items are issued to the Warfighters. In each case, the Warfighter physically comes to the CIF and some type of menu document is generated. All issue data that is generated as a direct result of body measurements derived from the 3D Body Whole Body Scanner (dark blue boxes) will result in an IRM Scan Form being compiled and generated. This form is completed, optically and read back into IRM, and then inserted into IRM's version of the clothing record. That issue data is then electronically communicated to the CIF/ISM system

where the official ARMY ISM Clothing Record and Property Book are updated (light blue boxes). All data not derived from the 3D Whole Body Scanner input (green boxes) is handled using the ISM Menu and manually entered into CIF/ISM using existing CIF/ISM screens

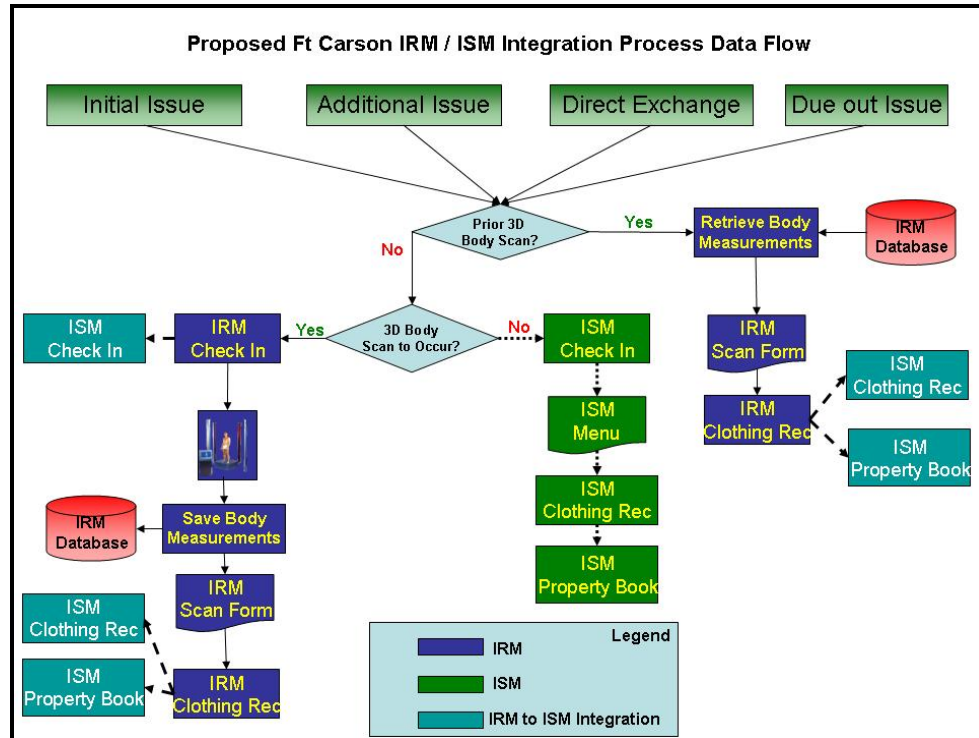
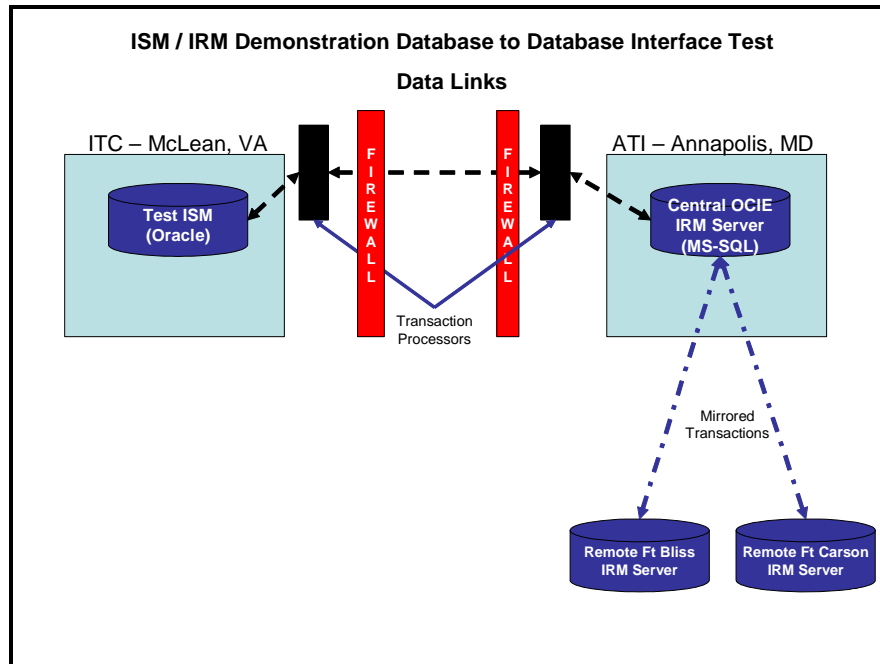


Figure 12 - Ft. Carson IRM/ISM Integration Process Data Flow

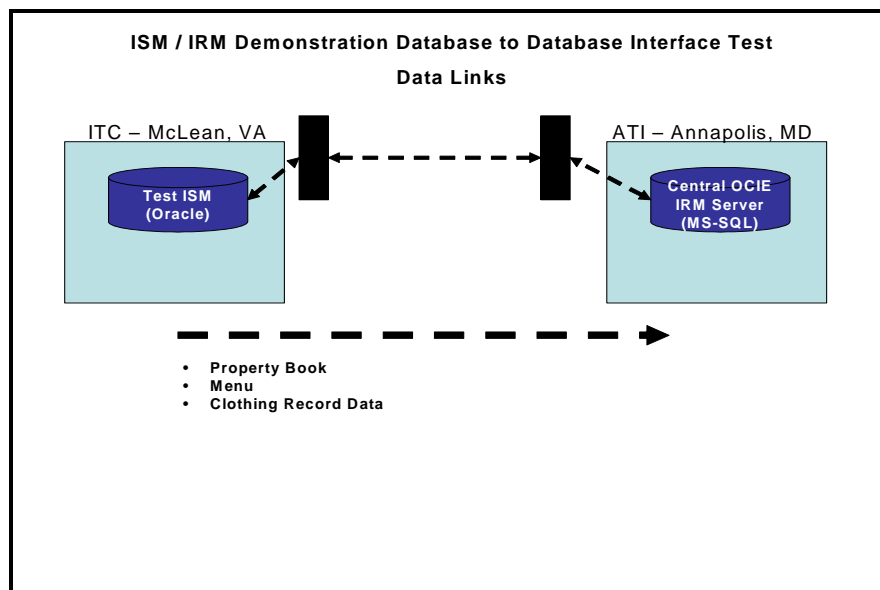
4.11.4 ARN-IRM to CIF-ISM Interface Database to Database Exchanges

The interface test was preceded by five months of development work, as shown in the following illustrations:

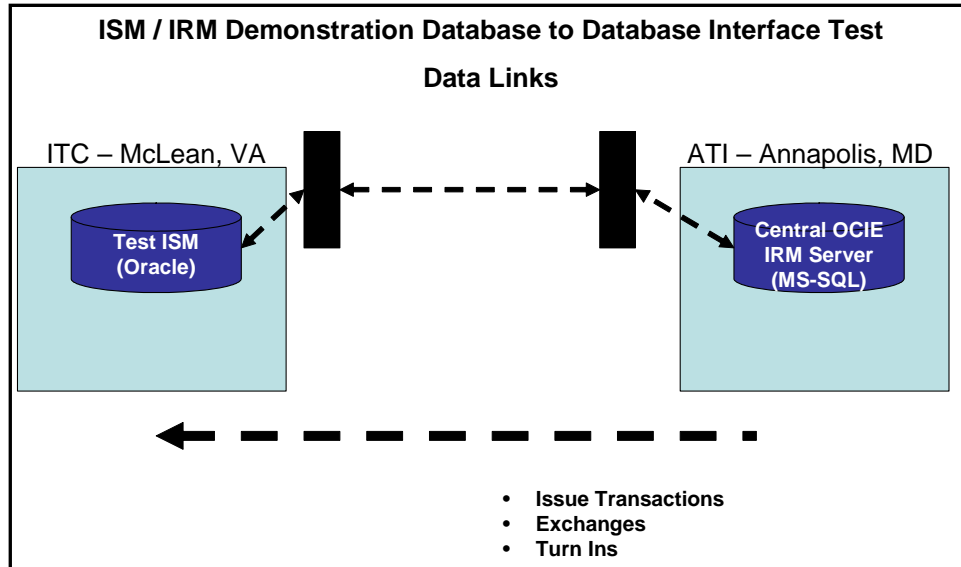
- Establish black box transaction processors for data exchange between ISM, using Oracle database, and IRM, using MS-SQL database.



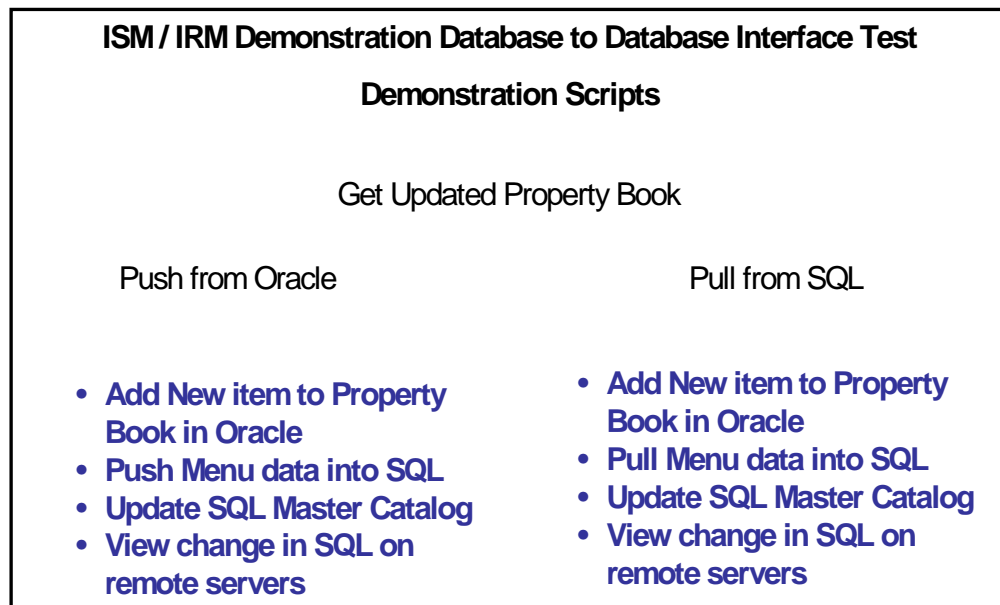
- Establish data link for Property Book, Menu, and Clothing Record data to IRM.



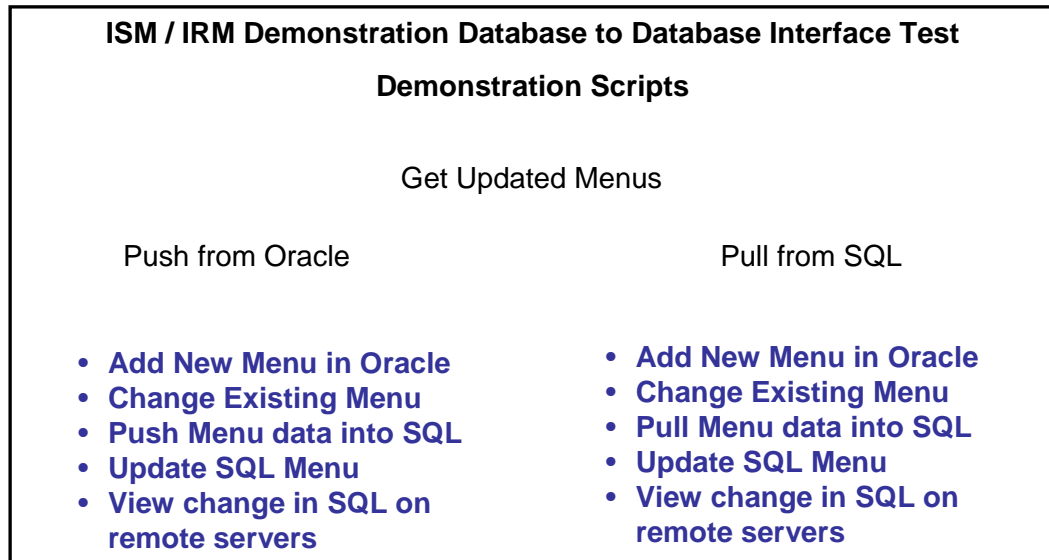
- Establish data link for Issue, Exchanges, and Turn In transactions to ISM.



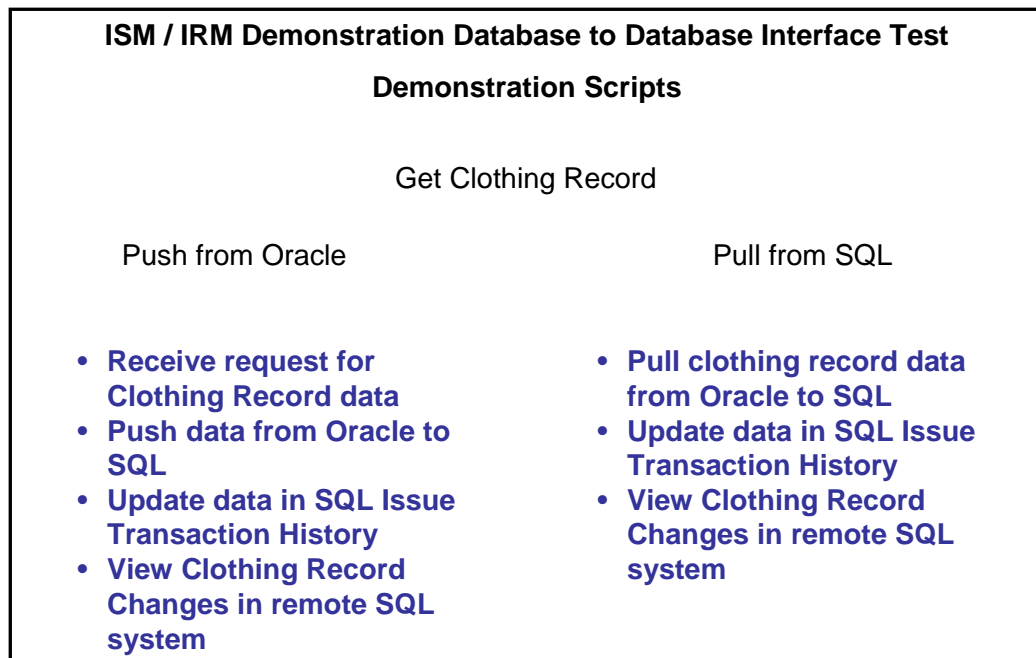
- Develop demonstration scripts for exchange of updated Property Book



- Develop demonstration scripts for exchange of updated Menus



- Develop demonstration scripts for exchange of Clothing Record data



- Develop demonstration scripts to Process Issue Transactions

ISM / IRM Demonstration Database to Database Interface Test	
Demonstration Scripts	
Process Issue Transactions	
Pull from Oracle	Push from SQL
<ul style="list-style-type: none"> • Check in Soldier • Build menu and generate Scan Form • Process Scan Form • Generate "Issue Receipt" Document • Pull data into Oracle from SQL • Update Clothing Record • Update Property Book • View Clothing Record • View Property Book 	N/A

- Develop demonstration scripts to Process Exchanges

ISM / IRM Demonstration Database to Database Interface Test	
Demonstration Scripts	
Process Exchanges	
Pull from Oracle	Push from SQL
<ul style="list-style-type: none"> • Process Exchanges • Pull data into Oracle from SQL • Update Clothing Record • Update Property Book • View Clothing Record • View Property Book 	N/A

- Develop demonstration scripts to Process Turn-ins

ISM/ IRM Demonstration Database to Database Interface Test	
Demonstration Scripts	
Process Turn-ins	
Pull from Oracle	Push from SQL
<ul style="list-style-type: none"> • Process Exchanges • Pull data into Oracle from SQL • Update Clothing Record • Update Property Book • View Clothing Record • View Property Book 	NA

5.0 VITUS/SMART 3D BODY SCANNER INTEGRATION AT CIF, FT. CARSON

5.1 Orientation

Prior to the award of the delivery order for this project, Human Solutions of North America, Inc. and Human Solutions GmbH (Germany) traveled to MCRD-PI on July 14, 2003 and attended the ARN Workshop, July 15-17, 2003, Columbia, SC. This provided the opportunity for Human Solutions personnel to better understand the work requirement at Ft. Carson and to build a personal profile of operations.

Following the activities proposed in the original Delivery Order and subsequent modifications, AdvanTech and Human Solutions worked collaboratively on integration of VITUS/Smart & ScanWorX software to ARN VIM-IRM and the AAVS DataMart for capture and integration of Human Solutions 3D Whole Body Scanner (VITUS/Smart) data outputs and results capture at Ft. Carson. Human Solutions initiated collection of Army sizing tables, and started analysis of the data necessary to construct size selection tables for use with the ScanWorX software.

Human Solutions performed analysis associated with the installation and set-up of the Human Solutions 3D Whole Body Scanner (VITUS/Smart) at Ft. Carson. Human Solutions of North America traveled to Ft. Carson on September 17, 2003 for site review and necessary preparation for the scanner installation. This provided the opportunity for Human Solutions to discuss and fix the spatial requirements, necessary modifications of the room, in preparation of the installation of the VITUS/Smart 3D body scanner.

5.2 Architecture

The Human Solutions VITUS/Smart 3D Whole Body Scanner integrated solution consists of two Windows XP workstations running the ScanWorX software and the 3D Whole Body Scanner. This system is linked to the ARN VIM/IRM, using AdvanTech's Merlin program to read both body measurements and predicted sizes from the ScanWorX/Fashion Fit software.

The Merlin program then generates the recruit requisition, which contains the individual recruit's personal data along with the predicted sizes and alternate sizes. This data is then used to populate the recruit's issue forms. The Merlin program also lets the operator select the platoon that is to be scanned and then passes the platoon listing to the Human Solutions PickList program. The operator uses the PickList program to select the recruits as they are scanned.

After being scanned, the recruit proceeds down the issue line with the issue scan form for issues and fitting. CIIP staff marks sizes of items issued on the issue forms as items are issued. At the last station, the scan forms are verified, collected and scanned. The issue data extracted from the scan forms then creates the recruits clothing records, drives replenishment, and future tariffs.

The following figure provides an illustration of the relationship of information system components installed at Ft. Carson as part of this STP. The diagram indicates the various stock movements affected by the implementation of the Human Solutions VITUS/Smart 3D body scanning technologies and related ARN SCM systems.

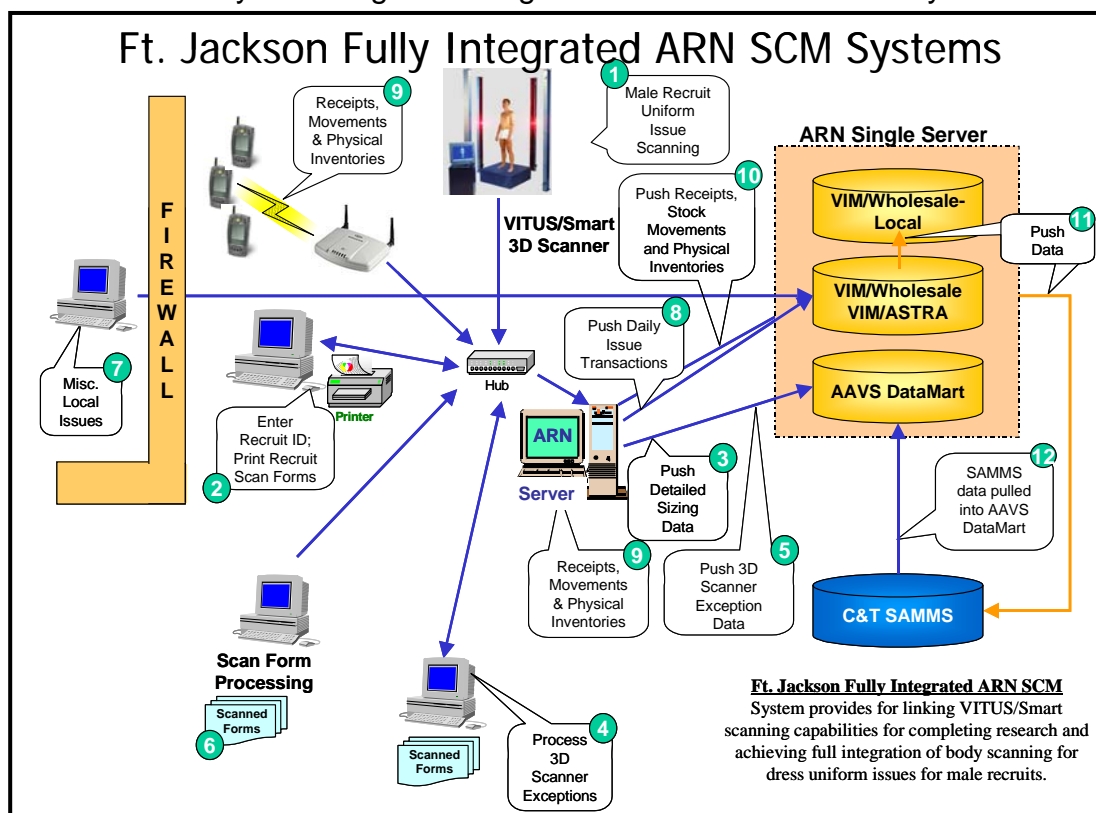


Figure 13 - Ft. Carson Information Systems Architecture and Data Flows

5.3 Review & Analysis of the Current Process

During the period 24 – 25 May 2004, AdvanTech, Inc. and the ARN Program Manager conducted a site visit and kick-off meeting at the Ft. Carson CIF. The purpose of the two-day site visit was to review potential changes and impacts to the Central Issue Facility (CIF) work flow, discuss placement of the Apparel Research Network-Integrated Retail Module (ARN-IRM) and the 3D Whole Body Scanner system, and discuss factors affecting the integration of the ARN systems into the CIF work flow.

At the beginning of Day 1 a courtesy visit was made with Renee M. Weatherby, Chief, Supply & Services Div., Department of Logistics (DOL), and Judy Campbell, CSR, DLA Customer Support Office. The remainder of Day 1 and the beginning of Day 2 was devoted to walk-throughs of the various areas of the CIF, and observing and documenting the soldier and workflow based on location of ARN – IRM and the 3D Whole Body Scanner.

During the Exit Interview and Kick-off a prioritized list of Ft. Carson CIF Implementation Issues was prepared, showing responsibilities and estimated completion dates for significant milestones. Additionally, the ARN-IRM & 3D Whole Body Scanner Implementation Schedule was prepared from the Implementation Issues.

The primary issue that resulted from the site visit was the need for the Installation Support Module (ISM) to import the CIF's source data that will be input into ARN-IRM by automated processes, and made available to ISM. AdvanTech, Inc. and ARN immediately contacted the ISM development group to discuss and plan for development of the ISM interface.

In more detail the following was achieved:

- Conducted a walk-through of the CIF to observe workflow changes instituted at the CIF since the ARN survey visits in 2003, and reviewed the ARN-IRM Components and Data Flow.
- Analyzed availability of data requirements such as Menus for Soldiers and units, and Soldier Demographic Data (Ability to get data pushed to ARN Network in order to populate this table on a regular basis).
- Coordinated with Ft. Carson DOL and CIF on how to acquire High Speed Data Connections, and conducted a Hand Held Terminal (HHT) Site Survey for Radio Frequency (RF) Network.
- Finalized with DOL & CIF the location of the ARN hardware and laid out the footprint (with masking tape) for the 3D Whole Body Scanner, reviewed workflow – Soldier flow for the location, and documented workflow and Soldier flow, and location for ARN – IRM hardware.
- Analyzed clothing items to be sized by the scanner and options for issuing items, items (from DLA or Army direct purchased) actively issued, option to scan, size, pick sized items, pack sized items for later issue, and option for soldiers to return and receive packed sized items & be is issued

remaining items.

- Analyzed the scanning of soldiers and determined to start scanning males only. Following stabilization of the system and procedures begin scanning females. Also analyzed the need for dressing rooms, need for privacy and safeguarding of valuables, and possible scanning of Soldiers currently stationed at Ft. Carson.
- Provided DOL & CIF an overview of ARN-IRM & Scanner data flow and discussed the following items pertinent to system installation, implementation, and operation:
 - Overview of hardware, wireless communication, and pulling of cabling; and,
 - Finalized ARN-IRM & Scanner placement with DOL & CIF, and determined cable lengths, and potential location of network access points within the facility.

5.4 VITUS/Smart Installation

The key operational step in the project was the installation of the VITUS/Smart 3D Whole Body Scanner at Ft. Carson. The pilot installation's initial data collection was the basis for acquiring US Army male sizing data and further operational validation of the automatic uniform issuing processes.

5.4.1 Definition and Preparation of Scanner Location

A decision on the location of the VITUS/Smart Body Scanner was made during the above mentioned site visit in May 2004. During the visit the requirements for the scanner installation were discussed in detail and decisions on the following room modifications were made:

- Scanner Location
- Room modifications included the following:
 - Need for dressing rooms
 - Need for privacy
 - Need for safeguarding of valuables

In addition to the modifications of the room the following points were considered and were accomplished:

- Network Connections – installed network connections between ARN VIM-IRM and the VITUS/Smart computers.
- Furniture – Ft. Carson provided desk and chair to host the scanner's control station.

The following figures show the newly integrated scanning room prepared by Ft. Carson, where the scanner was installed (photo taken at the beginning of March 2005), and the scanner enclosure.



Figure 14 – 3D Scan Room

5.4.2 Installation of VITUS/Smart – Time Schedule

The installation time schedule for the VITUS/Smart 3D Whole Body Scanner is shown in the following table. Installation of the scanner was completed in the first week of November 2004.

Date	Action
Nov. 2-3, 2004	Installation of the scanner configuration

Nov. 3, 2004	Calibration of the scanner
Nov. 4-5, 2004	Training of Ft. Carson personnel
Mid Dec., 2004	Start of the initial data collection

Table 8 - Time Schedule Installing 3-D Body Scanner

5.4.3 VITUS/Smart System Configuration

To achieve a high throughput, two PC Workstations are used in parallel as shown in the figure below. PC Workstation #1 is the Scan Station. The second workstation is the Fit Station. Thus, it is possible that while body measurements are extracted and the item sizes are predicted, the next recruit in line can be scanned simultaneously. With this approach the period of time recruits spend at the scanning station is reduced to a minimum. One staff person is responsible for checking the quality of the scan (no movements, correct clothing, correct posture, etc.), and for measurement extraction and size selection.

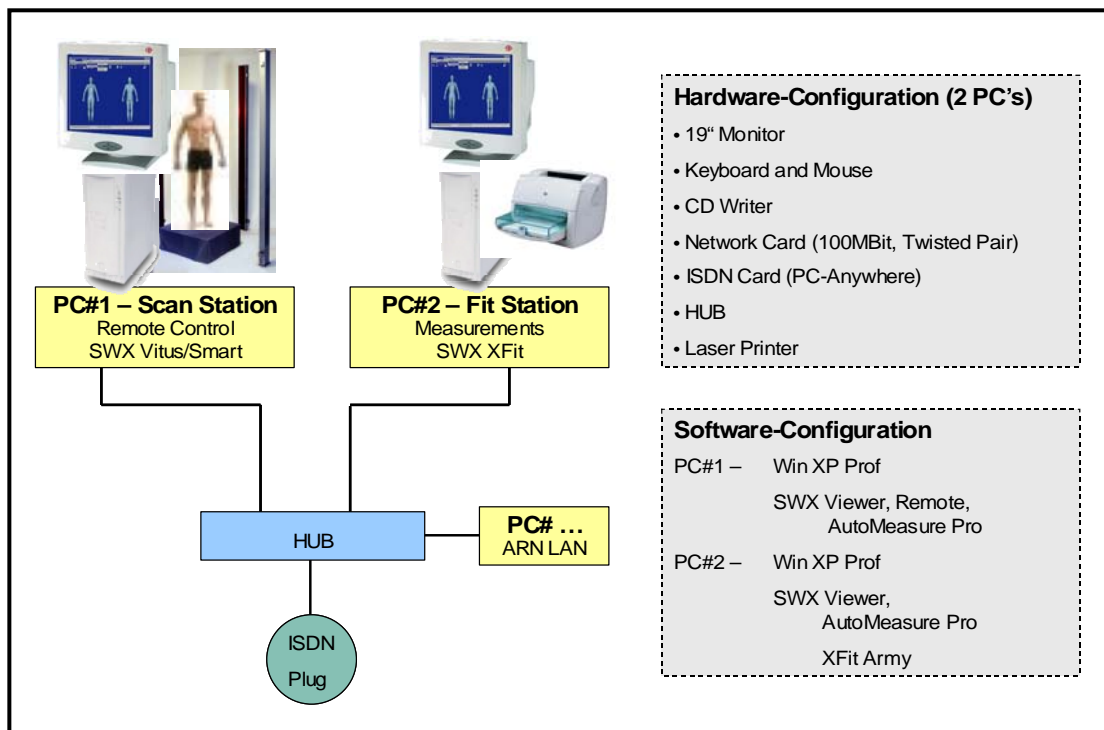


Figure 14 - Ft. Carson 3D Body Scanner Process – System Configuration

One of the most important things to speed up the process is a detailed explanation of the complete procedure in advance. Instruction posters support the verbal instructions.

5.4.4 3D Body Scanning Process and Data Flow

The scanning process, the exchange of information between the two scanner computers, and the flow of information during the recruits scanning process is illustrated in the following figure. This figure illustrates the flow of data to match body measurements with sized items to input data to the sizing protocol.

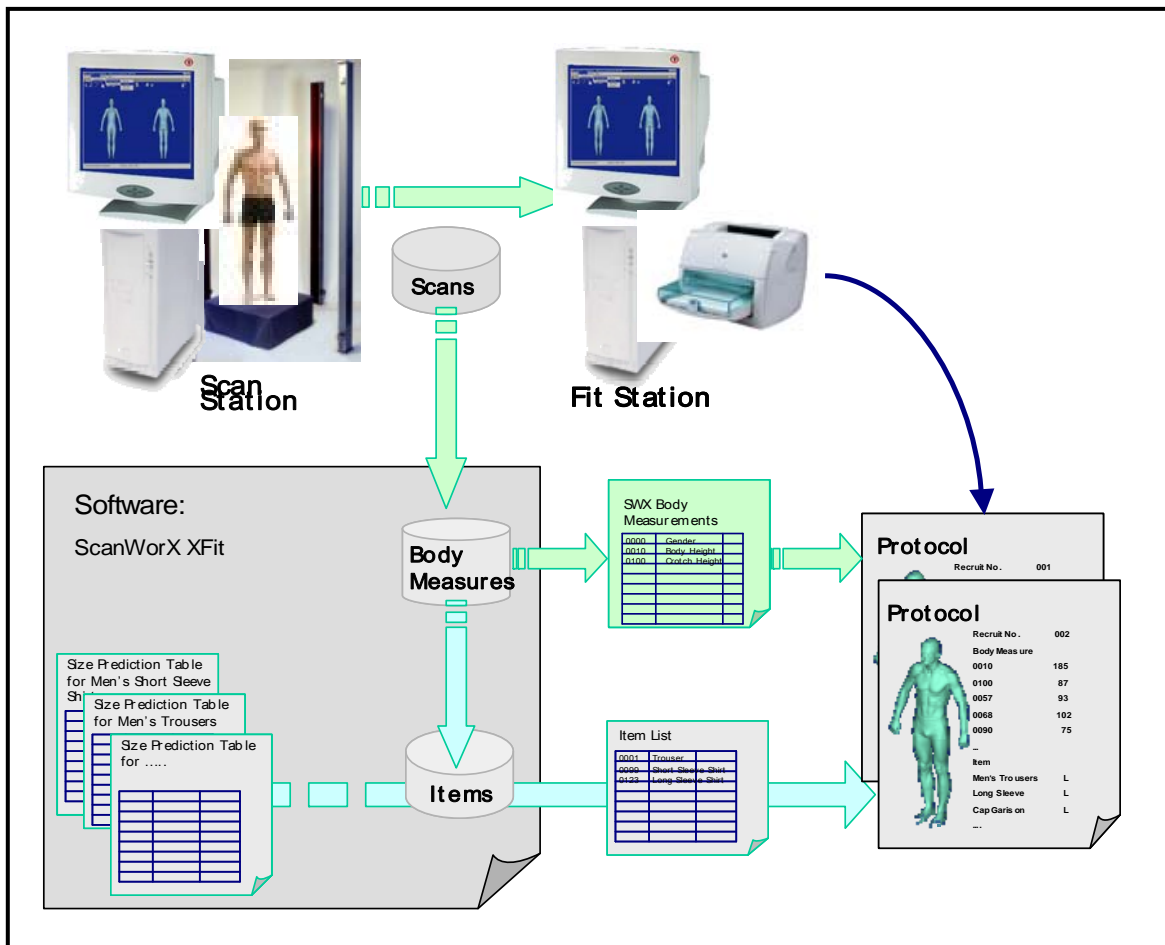


Figure 15 - Ft. Carson 3D Body Scanner Process – Data Flow

5.4.5 Recruit Size Selection File

The predicted sizes of a scanned recruit are recorded in a .sff file, which forms the interface to the further processing of the recruits body measurement and uniform items data. An example of a .sff file and the structure of the file are illustrated in the following figure that illustrates the structure of the soldier's "Size Selection" file.

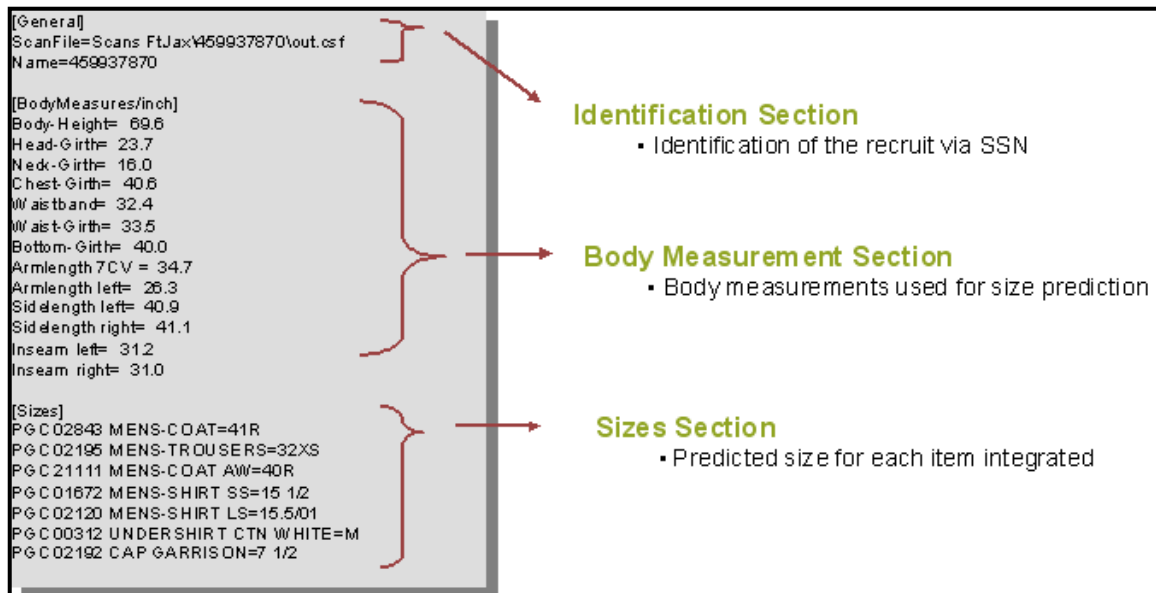


Figure 16 - Structure of the Soldier's "Size Selection" File

5.4.6 Development and Use of Merlin Application

AdvanTech, following development of requirements definitions, created the Merlin application that looks for folders (with names matching the SSN of the recruit scanned) with a Human Solutions output file. After getting a list of new files, the Merlin application reads the files, extracts PGC numbers with their suggested sizes and creates a requisition for that recruit. The Merlin application loads a small set of alternate sizes based on a matrix indexed by the suggested size into the requisition and then prints the issue form. Additionally, Merlin stores the body measurements found in the output file by transferring the data to ARN-IRM.

5.4.7 3D Whole Body Scanning Process

The following figure shows the integration of the initial data collection process into the existing issue workflow. The steps in the green box are the new ones.

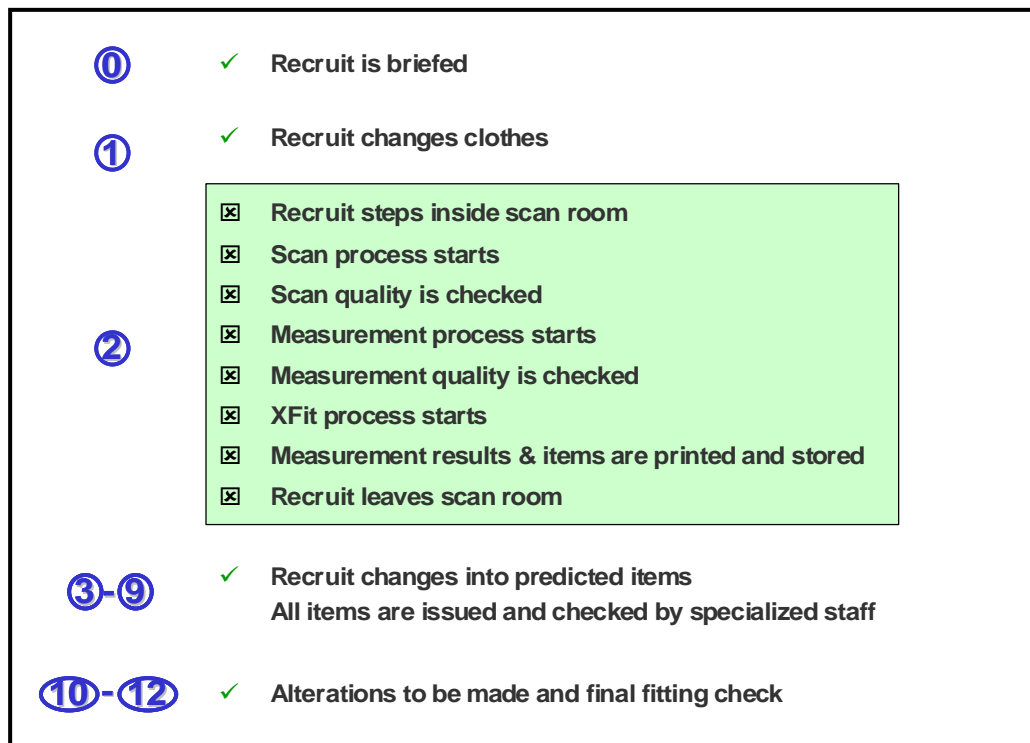


Figure 17 - Ft. Carson 3D Body Scanning Process for Initial Data Collection

5.5 Body Measurement Extraction

The next portion of the project focused on analyzing the data from this initial data collection period. Specifically, data was analyzed dealing with the time for each recruit to go through various elements of the entire fitting process.

5.5.1 Scanning Posture

The prerequisite for reliable body measurements is the correct position and posture of the scanned person during the scanning process. The recruits were advised by the scanner operator and were also supported by a poster with visual information (see Appendix G – Scan Posture Poster).

The correct scanning posture was defined as follows and was checked by the scan operator prior to initiating the 3D scanning of the recruit:

1. The recruit must wear close fitting underwear (not boxer shorts).

2. The recruit stands on the scanner platform with his feet on “footprints” painted on the platform to indicate proper location. The footprints are positioned 20 centimeters (cm) apart at the feet. The recruit stands erect with the weight distributed equally on both feet.
3. The recruit forms fists with his hands and slightly bends his arms at the elbows and poses his hands approximately one hand width apart from his hips. The backs of the hands are turned in front direction.
4. The recruit turns his head in a straightforward position.
5. The recruit is to breathe normally and takes a relaxed posture without flexing his muscles.

5.5.2 Automatic Body Measurement Extraction

The scans are analyzed with respect to a large set (approximately 80 different measurements) of body measurements. A list of body measurements for each recruit is generated on the second PC running the Human Solutions “ScanWorX Tailor” body measurement extraction software. The measurement extraction is a two-step process:

- (1) Determination of landmarks, i.e., characteristic points on the body surface; and,
- (2) Extraction of measurements by applying measurement rules on the landmarks.

The result of the landmark extraction is illustrated in the following figure.

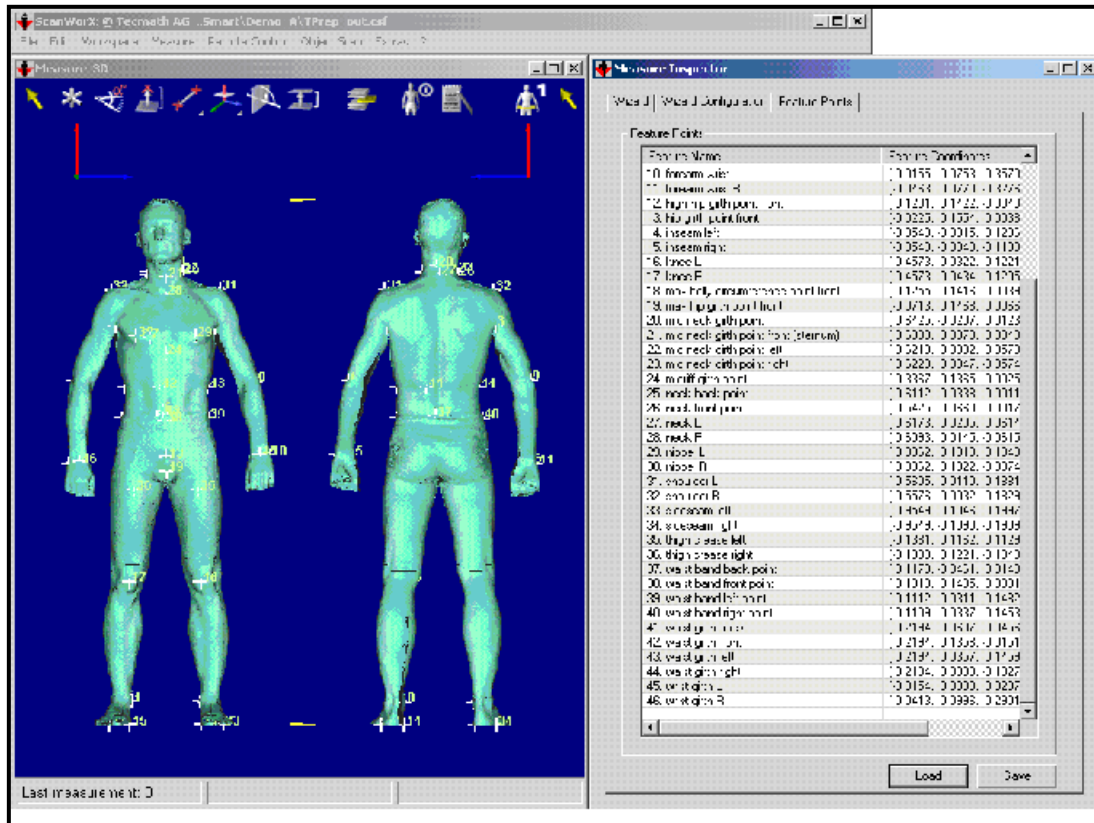


Figure 18 - ScanWorX Tailor Extraction of Landmarks

A set of predefined body measurements is extracted based on the extracted landmarks. The body measurement rules are defined on base of the extracted landmarks and apply the measurement rule to the 3D scan geometry. The result of the body measurement extraction process is illustrated in the following figure.

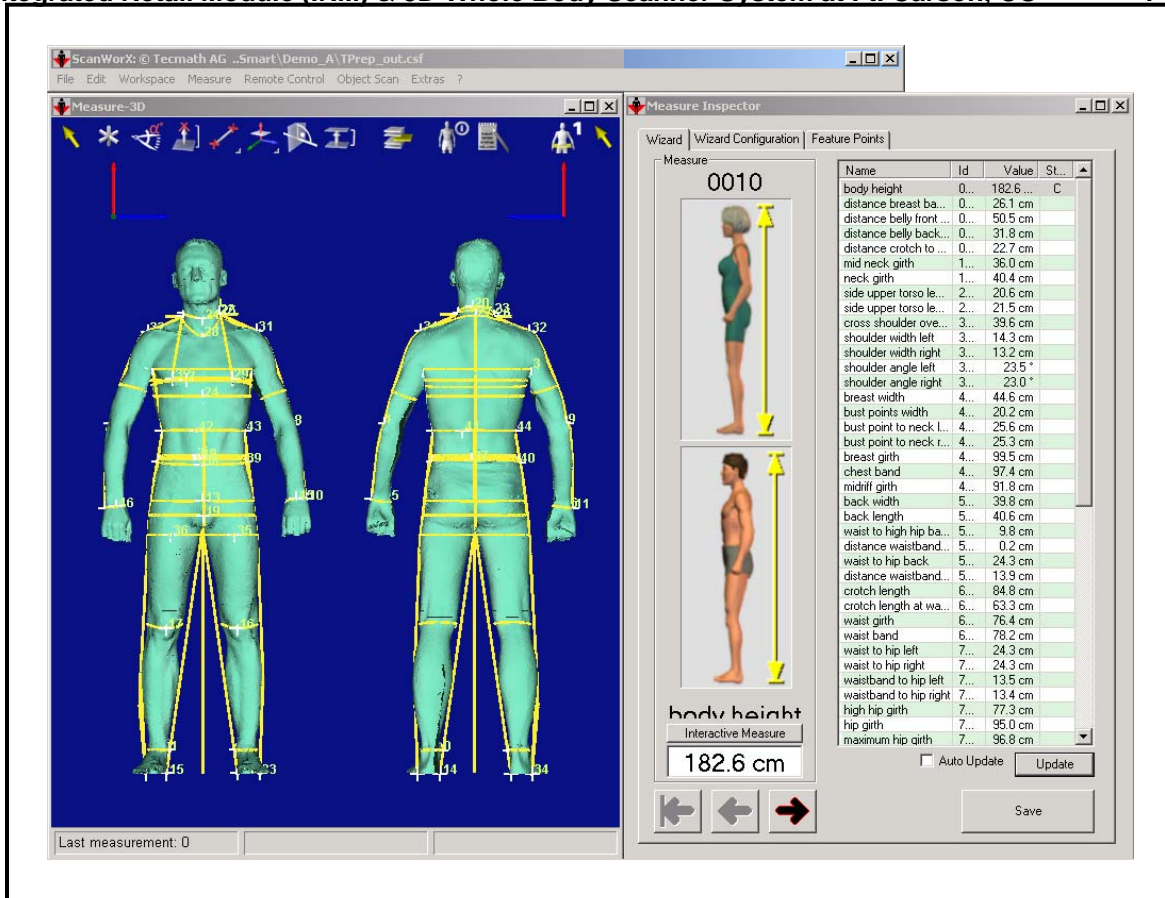


Figure 19 - ScanWorX Tailor Extraction of Body Measurements

The extracted body measurements for each recruit are saved in a body measurement file that is provided in the recruits scan folder for size prediction.

5.5.3 Body Measurements for Size Prediction

Body dimensions were identified that are the main driver for the size prediction. These are listed and explained in detail in Appendix G – Body Dimensions used for Size Selection.

5.6 Automatic Uniform Size Selection

5.6.1 Size Selection Process

The size selection prediction process is illustrated in the following figure. This figure provides a visualization of the hardware and software components and the flow of information from 3D scanning of the soldier to the determination list of selected sizes to

be issued to the recruit. The sequence of steps for processing as illustrated in the figure includes the following:

1. The 3D body scanning of the soldiers to capture the complete body surface of the soldier with the 3D full body scanner VITUS/Smart is completed as a first step. The primary soldier data from the 3D scan is compared to a small set of one dimensional conventional body dimensions
2. Automatic body measurement extraction is completed from the extraction of appropriate body dimensions from the 3D scans of the soldiers, allowing the system software to automatically extract a large number of body dimensions according to defined measurement rules.

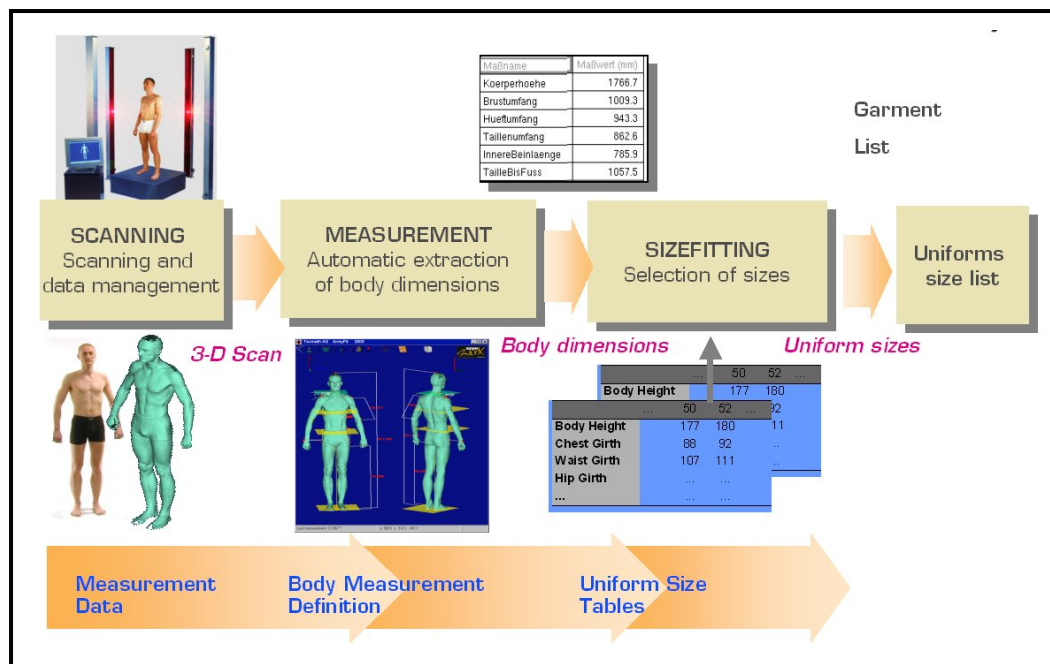


Figure 20 - Garment Size Selection Process

3. The Automatic Size Selection is based on extracted body measurements and item specific size selection rules and algorithms that are based on the results of statistical analysis of empirically sampled size selection data the best fitting garment size is predicted.

5.6.2 Size Selection Methodology

A crucial point for garment size selection is based on the availability of appropriate and sufficient size-body-relation information and appropriate size selection rules and size prediction algorithms. Further size selection rules and algorithms strongly depend on

the type of uniform, the functional requirement and garment patterns used for the manufacturing.

The “best fit size” is that size which fits best to an individual subject. This definition comprises both: fit according to predefined standards and regulations following an objectified “notion of fit,” and fit according to the individual feeling of the individual that is strongly influenced by subjective criteria of fit. Relating and comparing individual body measurements with corresponding measurements of the garment item sizes typically can describe both definitions.

Information in garments size tables typically only relates primary body measurements like body height, chest girth, waist girth etc. with a certain item size. This is by far not sufficient for reliable size selection algorithms, since the “best size” selection is influenced by a number of factors including the following:

- **Designer intentions:** The intended “look and feel” has to be addressed when a best-fit size is selected. For example, a pair of jeans has a different look and feel than the pants from a business suit, and an Army soldier’s uniform fits differently than a Marine or Navy uniform.
- **Postural influences:** Two subjects may have nominally identical body dimensions but one may have a normal posture, whereas the second may have a rounded back. Both subjects may not fit into the same garment size. Thus, incorporation of postural information is necessary.
- **Individual Preferences:** Additionally, fit often is based on subjective criteria or experience of the fitter. As results from other projects show, two different fitters may prefer two different sizes for the same soldier, thus there are two different “notions of fit”, even if the regulations are the same. To the extent possible, the fit of uniforms should be based on the established regulations and exclude the subjective influences of the fitters.
- **Objectiveness of size fitting:** Size fitting may follow different goals (e.g., highest satisfaction of the customer or objectified notion of fit vs. least amount of modification by the manufacturer), but for some applications it may make sense to focus only on certain fitting criteria. Thus, if modifications to predefined garment sizes are necessary; sizes should be selected that minimizes the effort and work for the modification. For example, it is simpler to shorten the sleeve lengths than to widen the chest and waist of a jacket.
- **Manufacturer specific “interpretation” of sizes:** Most garment manufacturers use standardized garment size charts. Since only a few

basic body dimensions often describe these charts, manufacturers are free to vary the final garment size within a certain range.

5.6.3 Size selection algorithm development

To develop and optimize item specific size prediction algorithms and reliable selection rules it is necessary to analyze correlations between large numbers of body measurements and the best fitting or issued (according to specific “fit philosophy”) garment item size of a large number of samples. The size selection methodology and development of the algorithms is based on the following steps:

- (1) Initial Set-up of the size selection rules and algorithms based on body dimensions or use of predefined size tables available from the existing size table information available in the Technical Specifications and/or Fit Manuals and integration into the ScanWorX size prediction software.
- (2) Data collection (scan, body measurements, size selection) and fit assessment for the statistical analysis and characterization of each item size. A sufficient number of subjects for each item size have to be scanned to gain statistically valid results for each item size.
- (3) Statistical analysis of the size selection philosophy and adjustment of size selection rules based on data collection results (identification of discriminating body dimensions, distribution parameters of each body measurement within each size, dependencies between body measurements, etc.).
- (4) Optimization of the size selection configuration the size selection software according to the results of the data analysis.
- (5) Validation of size selection where automatically predicted sizes are fitted and compared to the sizes issued.

The overall process of generating appropriate garment size selection algorithms and adapting the size selection rules for generating the automatic size selection is shown in the following figure.

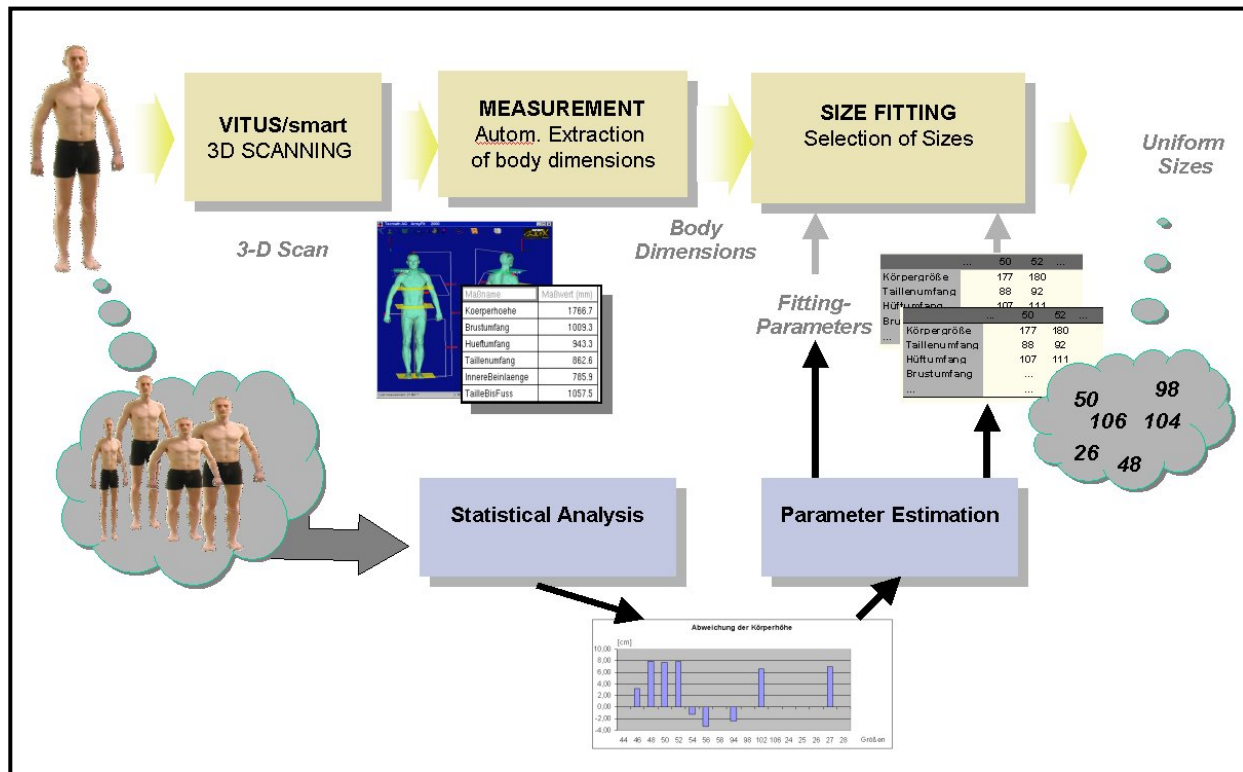


Figure 21 - Development and Optimization of Size Selection Rules and Algorithms

Development and optimization of size selection rules and algorithms is an iterative process. Thus, the previous described step (2) to step (5) are performed in a loop.

5.6.4 Uniform Item and Size Table Definition for Automatic Size Prediction

The work and elaboration was based on the size table information from existing Technical Manuals (TM 10-227), detail information from garment specifications (e.g., available commercial item descriptions) for Army male uniform garment items.

The following table indicates the uniform items that were included into the automatic size issuing process. For these items size tables and size selection rules are partially available from Army Fit Manual (TM 10-227). This information was researched for development of appropriate size selection tables for automatic size prediction. This information was completed and validated during the initial sites and base lining activities.

Table 9 - Sizing Systems and number of Size of the Male Uniform Items selected for Automatic Size Prediction

PGC	NOMENCLATURE	>= 10 SIZES?	TOTAL NSNS	DSN	Spec. Doc. acc. to C&T Warfighter
01941	DRAWERS C/W POLY-PRO	N	7	444-5703	A-A-55246
02362	PARKA W/W (RAINSUIT)	N	7	444-3231	MIL-P-87089
02665	SHIRT C/W BLK FLEECE	N	5	444-5703	A-A-59548
00399	TROUSER W/W	N	6	444-3231	MIL-P-43907
02363	TROUSER W/W (RAINSUIT)	N	7	444-3231	MIL-P-87099
01942	UNDERSHIRT C/W POLY-PRO	N	7	444-5703	A-A-55246
02146	COAT C/W DCU	Y	18	444-5617	MIL-C-43455
02164	COAT CAMO ABDU DSRT	Y	15	444-5825	MIL-C-44371
02666	OVERALLS FLEECE BLK	Y	10	444-5703	A-A-59549
01918	PARKA C/W ECWCS	Y	17	444-5703	MIL-P-44188
02637	PARKA ECWCS DSRT	Y	17	444-5703	MIL-P-44188
01917	TROUSERS C/W ECWCS	Y	17	444-5703	MIL-T-44189
01736	TROUSERS C/W WDLD CAMO	Y	11	444-3182	MIL-T-43497
02151	TROUSERS DCU	Y	24	444-3070	MIL-T-44047
02671	TROUSERS ECWCS DSRT	Y	17	444-5703	MIL-T-44189

Additional items:

PGC	Nomenclature	Not Less Than 10 Sizes	Total of NSNs	DSN	Spec. Doc. Acc. To C&T Warfighter
00352	LINER, COLD WEATHER COAT	N	8	444-7021	MIL-L-43536F
00356	LINER, COLD WEATHER TROUSERS	N	8	444-3185	MIL-L-43498D
00481	COVERALLS, SAFETY, INDUSTRIAL				
00616	JACKET, FLYER'S				
01755	BODY ARMOR, FRAGMENTATION PROTECT	Y	10	444-5671	MIL-B-44194A
01772	OVERALLS, COMBAT VEHICLE CREWMEN	Y	15	444-2878	MIL-O-44109B
01812	BODY ARMOR, FRAGMENTATION PROTECT	N	8	444-2445	MIL-B-44053A
01820	SUIT, CHEMICAL PROTECTIVE		8	444-5675	?
01928	OVERALLS, COLD WEATHER	N	8	444-5703	A-A-59549
01942	UNDERSHIRT, COLD WEATHER	N	7	444-5703	A-A-55246
02083	TROUSERS, MEN'S	Y	46	444-7021	?
02153	COAT, CAMOUFLAGE PATTERN	Y	28	444-3070	MIL-C-44048
02165	TROUSERS, CAMOUFLAGE PATTERN	Y	15	444-3055	MIL-T-44372A
02176	COVERALLS, COMBAT VEHICLE CREWMEN	Y	15	444-2878	MIL-C-44077B
02194	COVERALLS, FLYERS'		24	444-5671	YAGC91-03
02204	TROUSERS, COMBAT	Y	15	444-3055	MIL-T-44372A
02205	COAT, COMBAT	Y	15	444-3055	MIL-C-44371A
02252	TROUSERS, CAMOUFLAGE PATTERN	Y	24	444-5617	MIL-T-44047E
02253	COAT, CAMOUFLAGE PATTERN	Y	31	444-2483	MIL-C-44048
02254	COVERALLS, UTILITY	N	7	444-5671	A-A-55316
02259	JACKET, FLYER'S	Y	15	444-5671	MIL-DTL-31010
02260	LINER, FLYER'S JACKET	Y	15	444-5671	MIL-DTL-31010
02284	COVERALLS, COMBAT VEHICLE CREWMEN	Y	15	444-2878	MIL-C-44077B
02285	JACKET, COLD WEATHER	Y	15	444-5825	MIL-J-43924E
02442	COVERALLS, FLYERS'	Y	28	444-5671	?
02781	BALLISTIC ASSEMBLY, VEST, SMALL AR	N	8	444-2445	?
02809	DRAWERS, EXTREME COLD WEATHER	N	6	444-3016	A-A-59329
02812	UNDERSHIRT, EXTREME COLD WEATHER	N	6	444-3016	A-A-50383B

The main sources for size table information were technical documentation and descriptions of the items available in the TM 10-227 (Army Technical Manual for Fitting

Uniforms), Technical Specifications Documents (downloaded from the ASSIST web site) and information provided in the Warfighter Queries web pages (<http://ct.dscpl.dla.mil/Catalog/pgcs>).

The US Army Uniform Items have been analyzed with respect to the following criteria:

- Structure of the size system and number of sizes;
- Specification of the size by Body Measurements (BM) and Finished Measurements (FM); and,
- Merging of specifying information from Technical Manual and Item specification document.

The results of the analysis are illustrated and summarized in the table following (see “Sizing Systems number of Sizes and measurements of the Male Uniform Items selected for Automatic Size Prediction”) showing the identified type of sizing system (1-dimension or 2-dimensional), the number of sizes of the item as well as the body measurement and final measurement information.

Table 10 - Sizing Systems Number of Sizes And Measurements Of The Male Uniform Items Selected For Automatic Size Prediction

PGC	Item	Military Specification	total size items	BM = Body Measures (TM); FM = Finished Measurements (ASSIST);							
01941	DRAWERS C/W POLY-PRO	A-A-55246	7	FM Waist	FM Inseam	FM Cuff Width	FM Cuff Length				
02362	PARKA W/W (RAINSUIT)	MIL-P-87089	7	FM Chest	FM Sleeve	FM Length					
02665	SHIRT C/W BLK FLEECE	A-A-59548	5	BM Chest	FM Chest	FM Back Length	FM Sleeve Length				
00399	TROUSER W/W	MIL-P-43907	6	FM Waist	FM Inseam	FM Leg Circumference					
02363	TROUSER W/W (RAINSUIT)	MIL-P-87099	7	FM Waist	FM Length	FM Inseam					
01942	UNDERSHIRT C/W POLY-PRO	A-A-55246	7	FM Chest	FM Back Length	FM Sleeve Length	FM Neck	FM Cuff Width	FM Cuff Length		
02146	COAT C/W DCU	MIL-C-43455	18	BM Height	BM Chest Man	BM Chest Woman	FM Chest	FM Chest	FM Back Length	FM Sleeve Length	
02164	COAT CAMO ABDU DSRT	MIL-C-44371	15	BM Height	BM Chest	FM Chest	FM Back Length	FM Sleeve Length			
02666	OVERALLS FLEECE BLK	A-A-59549	10	BM Chest	BM Height	FM Chest	FM Inseam	FM Outseam			
01918	PARKA C/W ECWCS	MIL-P-44188	17	BM Height	BM Chest Man	BM Chest Woman	FM Chest	FM Chest	FM Back Length	FM Back Sleeve Len	FM Hood Flap Leng
02637	PARKA ECWCS DSRT	MIL-P-44188	17	BM Height	BM Chest Man	BM Chest Woman	FM Chest	FM Chest	FM Back Length	FM Back Sleeve Len	FM Hood Flap Leng
01917	TROUSERS C/W ECWCS	MIL-T-44189	17	BM Inseam	BM Waist	FM Waist	FM Inseam	FM Outseam			
01736	TROUSERS C/W WDL CAM	MIL-T-43497	11	BM Waist	BM Inseam	FM Waist	FM Inseam	FM Outseam	FM Knee	FM Bottom	
02151	TROUSERS DCU	MIL-T-44047	24	BM Inseam	BM Waist	FM Waist	FM Inseam	FM Outseam	FM Bottom	FM Knee	
02671	TROUSERS ECWCS DSRT	MIL-T-44189	17	BM Inseam	BM Waist	FM Waist	FM Inseam	FM Outseam			

Additional items:

PGC	Item	Military Specification	Total Of Size Items	BM = Body Measures (TM); FM = Finished Measurements (ASSIST); na = not available							
				BM	BM	FM	FM	FM	FM	FM	FM
00352	LINER, COLD WEATHER COAT	444-7021	8	Height	Chest	Chest	Back Length	Sleeve Length			
00356	LINER, COLD WEATHER TROUSERS	444-3185	10	Waist	Inseam	Waist	Inseam				
00481	COVERALLS, SAFETY, INDUSTRIAL	0									
00616	JACKET, FLYER'S	0									
01755	BODY ARMOR, FRAGMENTATION PRO	444-5671	10	Chest	Height						
01772	OVERALLS, COMBAT VEHICLE CREW	444-2878	15	Height	Waist	Inseam	Outseam	Knee			
01812	BODY ARMOR, FRAGMENTATION PRO	444-2445	8	Chest	Chest	Length					
01820	SUIT, CHEMICAL PROTECTIVE	444-5675	8								
01928	OVERALLS, COLD WEATHER	444-5703	10	Chest	Height	Chest	Inseam	Outseam			
01942	UNDERSHIRT, COLD WEATHER	444-5703	7	Chest	Back Length	Sleeve Length	Neck				
02083	TROUSERS, MEN'S	444-7021	46								
02153	COAT, CAMOUFLAGE PATTERN	444-3070	29	Chest	Height						
02165	TROUSERS, CAMOUFLAGE PATTERN	444-3055	15	Waist	Inseam	Waist	Inseam	Outseam	Bottom		
02176	COVERALLS, COMBAT VEHICLE CREW	444-2878	15	Chest	Height	Chest	Sleeve Length	Waist	Inseam		
02194	COVERALLS, FLYERS'	444-5671									
02204	TROUSERS, COMBAT	444-3055	15	Waist	Inseam	Waist	Inseam	Outseam	Bottom		
02205	COAT, COMBAT	444-3055	15	Height	Chest	Chest	Back Length	Sleeve Length			
02252	TROUSERS, CAMOUFLAGE PATTERN	444-5617	24	Waist	Inseam	Waist	Inseam	Outseam	Bottom	Knee	
02253	COAT, CAMOUFLAGE PATTERN	444-2483	31	Chest	Height						
02254	COVERALLS, UTILITY	444-5671	7	Chest	Waist	Overall Length					
02259	JACKET, FLYER'S	444-5671	15	Height	Chest	Chest	Back Length	Sleeve Length	Waist Draw	Bottom Draw	
02260	LINER, FLYER'S JACKET	444-5671	15	Height	Chest	Chest	Back Length	Sleeve Length			
02284	COVERALLS, COMBAT VEHICLE CREW	444-2878	15	Chest	Height	Chest	Sleeve Length	Waist	Inseam		
02285	JACKET, COLD WEATHER	444-5825	15	Chest	Height	Chest	Back Length	Sleeve Length			
02442	COVERALLS, FLYERS'	444-5671	28								
02781	BALLISTIC ASSEMBLY, VEST, SMALL	444-2445	8	Chest							
02809	DRAWERS, EXTREME COLD WEATHER	444-3016	6	Waist	Inseam						
02812	UNDERSHIRT, EXTREME COLD WEATHER	444-3016	12	Chest	Length	Sleeve Length	Shoulder Length				

The above table indicates that for each item at least one body measurement (BM) is specified in the Technical Specification Documents or in the Army Fit Manual. For the items based on two-dimensional size systems like the men's coat or the men's trousers

at least two specified body measurements could be identified. Additionally finished measurements (FM) are available for some items.

Based on the above initial size selection tables have been extracted and developed, which form the base for integration into the Size Prediction Software. In the following table the initial size selection table for the ECWCS Parka is shown as an example:

Table 11 - Initial Size Selection Table for PGC 01918 PARKA C/W ECWCS

Size	Size		BM Height		BM Chest Man		BM Chest Woman		FM Chest		FM Back Length		FM Back Sleeve Length		FM Hood Flap Length	
	Waist	Length	from	to	from	to	from	to	from	to	from	to	from	to	from	to
XS XS	XS	XS	59	63	29	33	32	36	41 1/4	42 3/4	25 3/4	27 1/4	25 1/2	27	25 3/4	27 1/4
XS S	XS	S	63	67	29	33	32	36	41 1/4	42 3/4	26 3/4	28 1/4	26	27 1/2	25 3/4	27 1/4
XS R	XS	R	67	71	29	33	32	36	41 1/4	42 3/4	28 1/4	29 3/4	27	28 1/2	25 3/4	27 1/4
XS L	XS	L	71		29	33	32	36	41 1/4	42 3/4	29 3/4	31 1/4	28	29 1/2	25 3/4	27 1/4
S XS	S	XS	59	63	33	37	36	40	45 1/4	46 3/4	26 1/4	27 3/4	25 3/4	27 1/4	26 1/4	27 3/4
S S	S	S	63	67	33	37	36	40	45 1/4	46 3/4	27 1/4	28 3/4	26 1/4	27 3/4	26 1/4	27 3/4
S R	S	R	67	71	33	37	36	40	45 1/4	46 3/4	28 3/4	30 1/4	27 1/4	28 3/4	26 1/4	27 3/4
S L	S	L	71		33	37	36	40	45 1/4	46 3/4	30 1/4	31 3/4	28 1/4	29 3/4	26 1/4	27 3/4
M XS	M	XS	59	63	37	41	40	44	49 1/4	50 3/4	26 3/4	28 1/4	26	27 1/2	26 3/4	28 1/4
M S	M	S	63	67	37	41	40	44	49 1/4	50 3/4	27 3/4	29 1/4	26 3/4	28 1/4	26 3/4	28 1/4
M R	M	R	67	71	37	41	40	44	49 1/4	50 3/4	29 1/4	30 3/4	27 1/2	29	26 3/4	28 1/4
M L	M	L	71		37	41	40	44	49 1/4	50 3/4	30 3/4	32 1/4	28 1/2	30	26 3/4	28 1/4
L S	L	S	63	67	41	45	41	45	53 1/4	54 3/4	28 1/4	29 3/4	26 3/4	28 1/4	27 1/4	28 3/4
L R	L	R	67	71	41	45	41	45	53 1/4	54 3/4	29 3/4	31 1/4	27 3/4	29 1/4	27 1/4	28 3/4
L L	L	L	71		41	45	41	45	53 1/4	54 3/4	31 1/4	32 3/4	28 3/4	30 1/4	27 1/4	28 3/4
XL S	XL	S	63	67	45	49	45	49								
XL R	XL	R	67	71	45	49	45	49	57 1/4	58 3/4	30 1/4	31 3/4	28	29 1/2	27 3/4	29 1/4
XL L	XL	L	71		45	49	45	49	57 1/4	58 3/4	31 3/4	33 1/4	29	30 1/2	27 3/4	29 1/4

Example: PGC 01918 PARKA C/W ECWCS. The following different size codes were found for a Medium Regular:

MED-REG from Warfighter Catalog
Medium Regular from Technical Specification

To remedy the differences, AdvanTech and Human Solutions agreed to use the PGC to identify the item. The PGC is part of the information generated in the result of the size selection and thus uniquely identifies the item. The name of the item is additionally available and the size coding of the items is as specified in the Warfighter Catalog (<http://ct.dscpl.dla.mil/Catalog>).

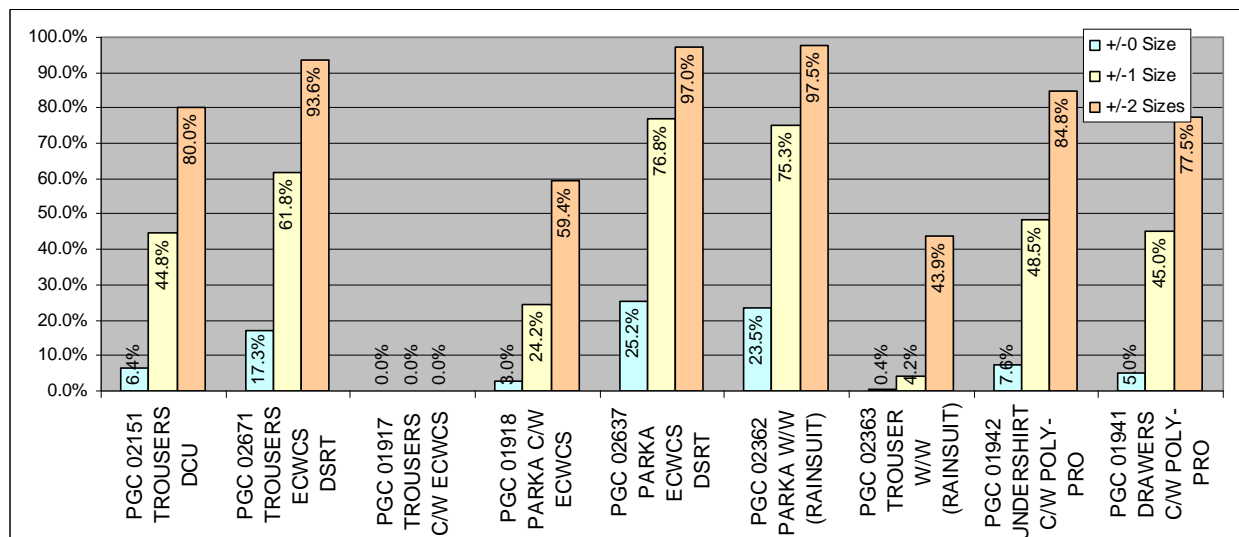
In the following sections the progress of the size selection rules development is described. In chronological order fitting rates are given for

- Initial fitting rules based on technical specifications alone (sec. 5.6.5)

- Refined fitting rules based on statistical approach and database of approximately 1,400 recruits scanned through February 2005 (sec. 5.6.6)
- Refined fitting rules based on statistical approach and database of approximately 1,300 recruits scanned through December 31, 2005 (sec. 5.6.7)
- Final fitting rules (sec. 5.6.8)

5.6.5 Initial Size Prediction Evaluation

In order to check the validity and plausibility of the item size information with respect to items issued in the initial data collection phase, the initial size selection tables based on the specified body measurements were integrated into the Human Solutions size prediction software. The results of the initial size selection configuration exclusively based on the information provided by the Technical Specifications and the Fit Manual. Please refer to the following diagram.



				PGC 02151	PGC 02671	PGC 01917	PGC 01918	PGC 02637	PGC 02362	PGC 02363	PGC 01942	PGC 01941
Configuration		Date		TROUSER	TROUSERS	TROUSER	PARKA	PARKA	PARKA	TROUSER	UNDERSHI	DRAWERS
V1	24. Feb 04	Cases	Total	1387	1387	1387	1387	1387	1372	1372	1387	1387
			noData	209	209	209	209	209	209	209	209	209
Based on Initial			noSize	712	958	199	170	738	12	12	1112	1107
			Fit	460	217	971	996	432	1151	1151	66	71
Data Collection			noFit	6	3	8	12	8	0	0	0	0
		Width	+/-0	62.2%	84.5%	68.7%	53.9%	62.3%	50.1%	49.4%	54.5%	42.3%
			+/-1	97.4%	84.5%	98.8%	97.2%	97.3%	96.4%	96.1%	93.9%	80.3%
			+/-2	98.7%	85.9%	99.2%	98.8%	98.2%	99.7%	99.7%	98.5%	95.8%
			>+/-2	98.7%	98.6%	99.2%	98.8%	98.2%	100.0%	100.0%	100.0%	100.0%
		Length	+/-0	58.6%	61.8%	66.4%	75.1%	77.0%	100.0%	100.0%	100.0%	100.0%
			+/-1	97.0%	85.9%	99.2%	98.8%	98.2%	100.0%	100.0%	100.0%	100.0%
			+/-2	98.7%	93.2%	99.2%	98.8%	98.2%	100.0%	100.0%	100.0%	100.0%
			>+/-2	98.7%	98.6%	99.2%	98.8%	98.2%	100.0%	100.0%	100.0%	100.0%
		Total	+/-0	38.8%	60.9%	45.8%	41.7%	48.4%	50.1%	49.4%	54.5%	42.3%
			+/-1	80.5%	84.5%	89.1%	85.9%	90.0%	96.4%	96.1%	93.9%	80.3%
			+/-2	97.2%	85.5%	99.1%	98.6%	98.2%	99.7%	99.7%	98.5%	95.8%
			>+/-2	98.7%	98.6%	99.2%	98.8%	98.2%	100.0%	100.0%	100.0%	100.0%
			noFit	1.3%	1.4%	0.8%	1.2%	1.8%	0.0%	0.0%	0.0%	0.0%

**Figure 22 - Evaluation Of Fitting Rates Based On
Technical Specification Size Tables**

In order to analyze the fitting rates the concept of “+/-1” and “+/-2” sizes of exact hits was introduced. The “+/-1” size is defined by all directly neighbored sizes within the size system of the item. For Example, a “40L” or a “39R” is within the “+/-1”-range of a “40R” of the Men’s Coat; a “39L” is within the “+/-2”-range of the “40R.” This is shown in the following figure (See “Definition of the metrics for “+/-1” and “+/-2” sizes).

-1 / +1	+ 1	+1 / +1
- 1	0	+ 1
-1 / -1	- 1	+1 / -1

Figure 23 - Definition of Metrics for “+/-1” and “+/-2” sizes

The predicted sizes have been evaluated on base of the recruit body measurement information gained from the initial data collection. The predicted sizes and the issued sizes were compared and analyzed. The results illustrated for a specific item size “40L” of the Men’s Coat are illustrated in the following figure and summarized in the comments following the figure.

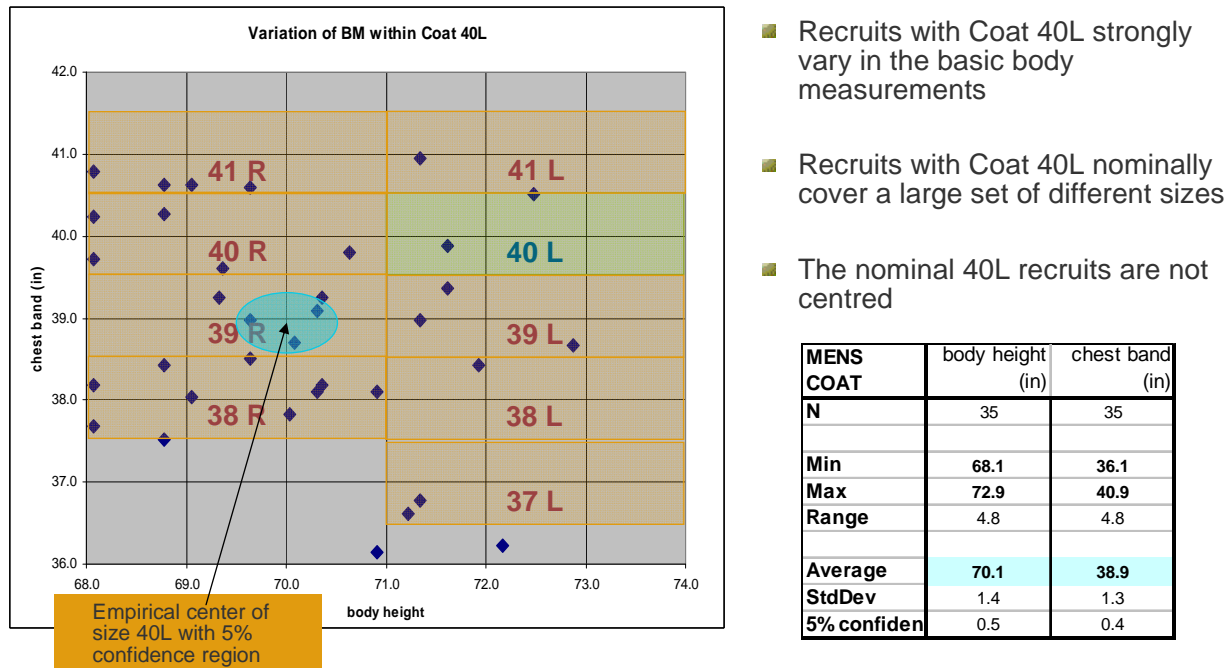


Figure 24 - Variation of Body Measurements Within Issued Size (specifically size “40L” of Men’s Dress Uniform Coat)

1. Each item showed within each body measurement large variations within the sizes. The ranges of body measurements within one size were a multiple larger than the grading step between one and the next size.
2. The distribution of the body measurements around the specified reference values of a size is not symmetrical, i.e., there are systematic deviations between the nominal size values and the measurements of the recruits.

For illustration of the above effect observed and discussed for the “40L” the average values and the difference to the nominal values of all Men’s Coat size has been calculated and tabulated in the following figure.

COAT AG 489						
Average chest band (in)	COAT AG 489 - Length					Total
	XS	SM	RM	LM	XLM	
COAT AG 489 - Chest	38.5					
n.a.						
35			33.8		36.5	38.5
36		35.9	34.7	35.5		34.5
37		33.9	35.9	35.3		35.3
38		37.2	37.3	36.9	38.0	35.7
39		38.7	38.3	38.1	37.3	37.1
40		39.8	38.8	38.9	38.4	38.1
41			40.5	40.5		38.8
42		41.0	41.5	41.7	41.5	40.5
43			42.9	42.5	43.0	41.6
44			43.4	43.7	43.1	42.6
46			48.3	45.6	47.6	43.4
48			44.5			46.1
Total	38.5	38.4	38.6	39.6	40.5	44.5
						39.3

COAT AG 489						
Delta	COAT AG 489 - Length					Total
	XS	SM	RM	LM	XLM	
chest band (in)	63 1/2	66 1/2	69 1/2	72 1/2	75 1/2	
COAT AG 489 - Chest						
n.a.						
35			-1.2		1.5	0.2
36		-0.1	-1.3	-0.5		-0.6
37		-3.1	-1.1	-1.7		-2.0
38		-0.8	-0.7	-1.1	0.0	-0.7
39		-0.3	-0.7	-0.9	-1.7	-0.9
40		-0.2	-1.2	-1.1	-1.6	-1.0
41			-0.5	-0.5		-0.5
42		-1.0	-0.5	-0.3	-0.5	-0.6
43			-0.1	-0.5	0.0	-0.2
44			-0.6	-0.3	-0.9	-0.6
46			2.3	-0.4	1.6	1.2
48			-3.5			-3.5
Total		-0.9	-0.8	-0.7	-0.2	

Chest Girth

- Average chest girths calculated for all sizes for the mens coat

- Differences to the chest value provided in the Fit Manual and Technical Specification

- Difference values are basis to be integrated into size selection tables

less 15 more 15 than Samples

Figure 25 - Variation of Body Measurements Within Issued Size (specifically size "40L" of Men's Dress Uniform Coat)

5.6.6 Refinement of the Size Selection Rules

The refinement of the size selection rules, dated Feb. 28, 2005 and the development of the size prediction configuration were based in a first step on issue and body measurement data of approximately 1,400 recruits scanned through February 2005.

A systematic statistical analysis of the distribution of the observed body measurements was performed and for each of the items a set of significant body measurements influencing the size selection was identified. These are illustrated in the following table.

Body measurements for Size Prediction		Body Height	Armlength from 7. CV	Chest Girth	Waist Girth	Waist Band	Seat	Side Length to Waist	Inseam
01941	DRAWERS C/W POLY-PRO	X			X	X	X	X	X
02362	PARKA W/W (RAINSUIT)	X	X	X	X	X	X		
02363	TROUSER W/W (RAINSUIT)	X			X	X	X	X	X
01942	UNDERSHIRT C/W POLY-PRO	X	X	X	X	X	X		
01918	PARKA C/W ECWCS	X	X	X	X	X	X		
02637	PARKA ECWCS DSRT	X	X	X	X	X	X		
01917	TROUSERS C/W ECWCS	X			X	X	X	X	X
02151	TROUSERS DCU	X			X	X	X	X	X
02671	TROUSERS ECWCS DSRT	X			X	X	X	X	X

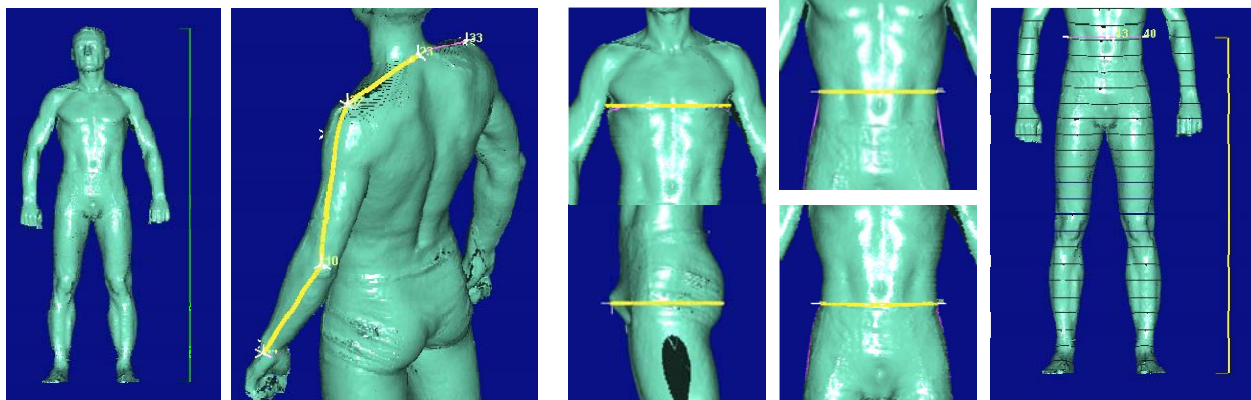
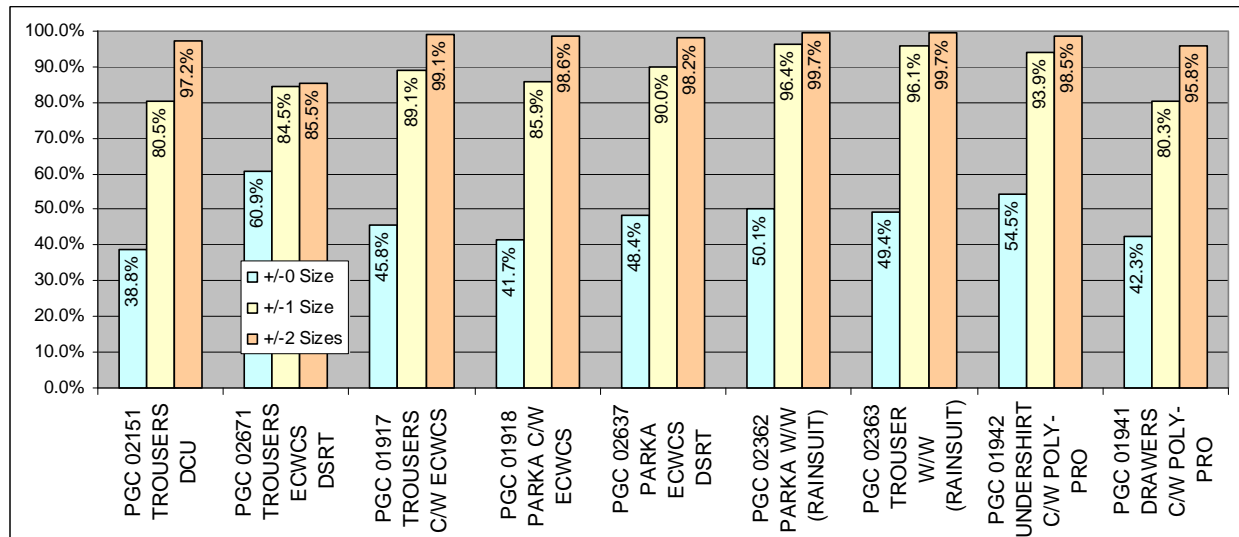


Figure 26 - Influencing Body Dimensions on the Size Prediction Quality

Basic structural information from the size tables and the results of the statistical analysis were merged into the setup of the size selection configuration.

The following figure shows the results of the fit rate evaluation. The scans available until end of February 2005 and the available information about the issued size was compared with the predicted sizes. The results were presented in detail at the review meeting in Ft. Carson on March 2, 2005. The following is a summary of the results analyzed for exact matches, +/-1 size matches and +/-2 sizes matches.



Configuration	Date		PGC 02151 TROUSER	PGC 02671 TROUSERS	PGC 01917 TROUSER	PGC 01918 PARKA	PGC 02637 PARKA	PGC 02362 PARKA	PGC 02363 TROUSER	PGC 01942 UNDERSHI	PGC 01941 DRAWERS
V1 Based on Initial Data Collection	24. Feb 04	Cases	Total	1387	1387	1387	1387	1387	1372	1387	1387
			noData	209	209	209	209	209	209	209	209
			noSize	712	958	199	170	738	12	1112	1107
			Fit	460	217	971	996	432	1151	66	71
			noFit	6	3	8	12	8	0	0	0
		Width	+/-0	62.2%	84.5%	68.7%	53.9%	62.3%	50.1%	49.4%	54.5%
			+/-1	97.4%	84.5%	98.8%	97.2%	97.3%	96.4%	96.1%	93.9%
			+/-2	98.7%	85.9%	99.2%	98.8%	98.2%	99.7%	99.7%	98.5%
			>+/-2	98.7%	98.6%	99.2%	98.8%	98.2%	100.0%	100.0%	100.0%
		Length	+/-0	58.6%	61.8%	66.4%	75.1%	77.0%	100.0%	100.0%	100.0%
			+/-1	97.0%	85.9%	99.2%	98.8%	98.2%	100.0%	100.0%	100.0%
			+/-2	98.7%	93.2%	99.2%	98.8%	98.2%	100.0%	100.0%	100.0%
			>+/-2	98.7%	98.6%	99.2%	98.8%	98.2%	100.0%	100.0%	100.0%
		Total	+/-0	38.8%	60.9%	45.8%	41.7%	48.4%	50.1%	49.4%	42.3%
			+/-1	80.5%	84.5%	89.1%	85.9%	90.0%	96.4%	96.1%	80.3%
			+/-2	97.2%	85.5%	99.1%	98.6%	98.2%	99.7%	99.7%	95.8%
			>+/-2	98.7%	98.6%	99.2%	98.8%	98.2%	100.0%	100.0%	100.0%
			noFit	1.3%	1.4%	0.8%	1.2%	1.8%	0.0%	0.0%	0.0%

Figure 27 – Fit Rates Evaluation Results

5.6.7 Optimization of the size prediction configuration

Based on the issued size records until the end of December 2005 the size prediction configuration for the original items, as well the additional items were optimized. Although, the initial size prediction rules for all additional items have been developed and integrated into the size prediction configuration, only for a small set of 5 items featured a sufficient number of issues for optimization.

For the optimization 1,300 data collected from July 1, 2005 through Dec. 31, 2005 were taken.

The following figure and table shows the fitting rates of the initial items.

		PGC 02151 TROUSER S DCU	PGC 02671 TROUSERS ECWCS DSRT	PGC 01917 TROUSER S C/W ECWCS	PGC 01918 PARKA C/W ECWCS	PGC 02637 PARKA ECWCS DSRT	PGC 02362 PARKA W/W (RAINSUIT)	PGC 02363 TROUSER W/W (RAINSUIT)	PGC 01942 UNDERSHI RT C/W POLY-PRO	PGC 01941 DRAWERS C/W POLY- PRO	TOTAL AVERAGE
Cases	Total	1298	1298	1298	1298	1298	1258	1257	1248	1248	1278
	noData	128	128	128	128	128	128	128	128	128	128
	noSize	804	761	293	272	760	97	96	45	48	352.9
	Fit	340	383	862	881	376	1033	1033	1075	1072	783.9
	noFit	26	26	15	17	34	0	0	0	0	13.1
Width	+/-0	66.9%	41.6%	63.3%	58.1%	40.7%	65.5%	64.5%	56.0%	53.2%	56.6%
	+/-1	92.1%	84.1%	97.9%	95.9%	88.5%	95.5%	95.0%	94.0%	87.8%	92.3%
	+/-2	92.6%	89.5%	98.3%	98.1%	91.2%	99.2%	99.2%	98.2%	98.6%	96.1%
	>+/-2	92.9%	93.6%	98.3%	98.1%	91.7%	100.0%	100.0%	100.0%	100.0%	97.2%
Length	+/-0	58.2%	57.5%	70.7%	72.5%	64.6%	100.0%	100.0%	100.0%	100.0%	80.4%
	+/-1	90.4%	84.8%	97.8%	98.0%	91.7%	100.0%	100.0%	100.0%	100.0%	95.9%
	+/-2	92.9%	89.5%	98.2%	98.1%	91.7%	100.0%	100.0%	100.0%	100.0%	96.7%
	>+/-2	92.9%	93.6%	98.3%	98.1%	91.7%	100.0%	100.0%	100.0%	100.0%	97.2%
Total	+/-0	43.2%	30.1%	46.8%	43.4%	31.5%	65.5%	64.5%	56.0%	53.2%	48.2%
	+/-1	80.1%	68.7%	87.0%	85.7%	72.2%	95.5%	95.0%	94.0%	87.8%	85.1%
	+/-2	91.8%	84.1%	97.8%	97.4%	89.8%	99.2%	99.2%	98.2%	98.6%	95.1%
	>+/-2	92.9%	93.6%	98.3%	98.1%	91.7%	100.0%	100.0%	100.0%	100.0%	97.2%
	noFit	7.1%	6.4%	1.7%	1.9%	8.3%	0.0%	0.0%	0.0%	0.0%	2.8%

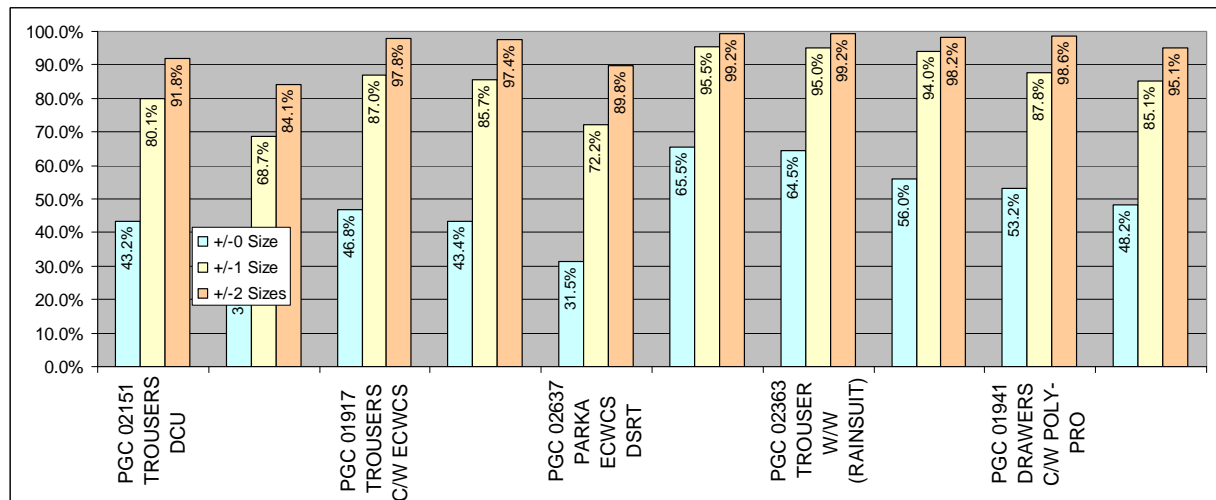


Table 12 – On-going Fit Rate Evaluation Results

The following table shows the list of additional items that were selected for integration into the size prediction software. Only those items with sufficient issued size records have been included in the charts.

		PGC 01755 BODY ARMOR, FRAGMENTATION	PGC 02153 COAT, CAMOUFLAGE	PGC 02284 COVERALLS, COMBAT VEHICLE	PGC 02285 JACKET, COLD WEATHER	PGC 02781 BALLISTIC ASSEMBLY, VEST, SMALL AR					TOTAL AVERAGE
Cases	Total	1298	1298	1298	1298	1280					1294
	noData	128	128	128	128	128					128
	noSize	897	760	897	896	493					788.6
	Fit	268	376	268	269	659					368.0
	noFit	5	34	5	5	0					9.8
Width	+/-0	44.0%	39.5%	37.0%	38.3%	48.6%					41.5%
	+/-1	92.7%	79.3%	89.7%	90.5%	95.0%					89.4%
	+/-2	98.2%	91.5%	98.2%	98.2%	99.2%					97.0%
	>+/-2	98.2%	91.7%	98.2%	98.2%	100.0%					97.2%
Length	+/-0	59.0%	36.3%	30.8%	49.6%	100.0%					55.1%
	+/-1	98.2%	83.9%	80.6%	98.2%	100.0%					92.2%
	+/-2	98.2%	91.7%	98.2%	98.2%	100.0%					97.2%
	>+/-2	98.2%	91.7%	98.2%	98.2%	100.0%					97.2%
Total	+/-0	20.1%	15.6%	6.2%	10.6%	48.6%					20.2%
	+/-1	77.7%	55.9%	53.1%	74.8%	95.0%					71.3%
	+/-2	97.8%	77.6%	80.6%	93.1%	99.2%					89.7%
	>+/-2	98.2%	91.7%	98.2%	98.2%	100.0%					97.2%
	noFit	1.8%	8.3%	1.8%	1.8%	0.0%					2.8%

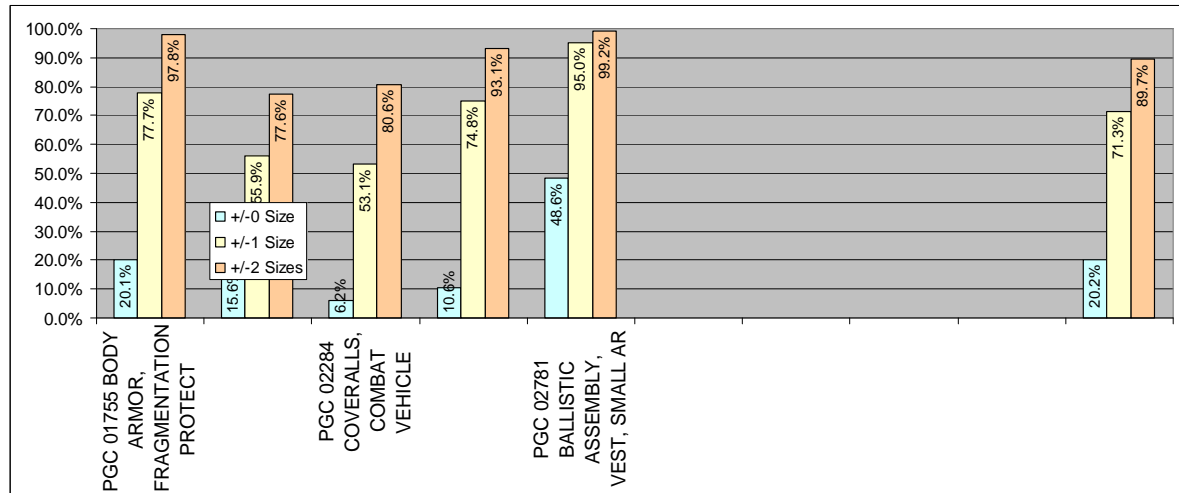


Table 13 – Additional Items Fit Rate Evaluation Results

In comparison the following charts show the fitting rates with an optimized size prediction algorithm, for both items, the initial ones as well as the additional ones.

		PGC 02151 TROUSERS S DCU	PGC 02671 TROUSERS ECWCS DSRT	PGC 01917 TROUSER S C/W ECWCS	PGC 01918 PARKA C/W ECWCS	PGC 02637 PARKA ECWCS DSRT	PGC 02362 PARKA W/W (RAINSUIT)	PGC 02363 TROUSER W/W (RAINSUIT)	PGC 01942 UNDERSHI RT C/W POLY-PRO	PGC 01941 DRAWERS C/W POLY- PRO	TOTAL AVERAGE
Cases	Total	1298	1298	1298	1298	1298	1278	1278	1248	1197	1277
	noData	128	128	128	128	128	128	128	128	128	128
	noSize	804	761	293	272	760	97	96	45	48	352.9
	Fit	354	397	867	889	398	1053	1054	1075	1021	789.8
	noFit	12	12	10	9	12	0	0	0	0	6.1
Width	+/-0	69.7%	57.2%	64.3%	59.9%	50.7%	65.5%	64.5%	59.1%	56.9%	60.9%
	+/-1	95.1%	91.4%	98.3%	97.1%	93.2%	95.5%	95.0%	95.5%	95.7%	95.2%
	+/-2	96.4%	95.1%	98.9%	99.0%	96.3%	99.2%	99.2%	99.3%	99.5%	98.1%
	>+/-2	96.7%	97.1%	98.9%	99.0%	97.1%	100.0%	100.0%	100.0%	100.0%	98.7%
Length	+/-0	61.7%	60.4%	74.9%	77.0%	65.1%	100.0%	100.0%	100.0%	100.0%	82.1%
	+/-1	94.3%	93.6%	98.6%	99.0%	97.1%	100.0%	100.0%	100.0%	100.0%	98.1%
	+/-2	96.4%	96.3%	98.7%	99.0%	97.1%	100.0%	100.0%	100.0%	100.0%	98.6%
	>+/-2	96.7%	97.1%	98.9%	99.0%	97.1%	100.0%	100.0%	100.0%	100.0%	98.7%
Total	+/-0	45.6%	38.4%	50.3%	47.8%	36.3%	65.5%	64.5%	59.1%	56.9%	51.6%
	+/-1	83.6%	78.0%	88.5%	87.7%	77.6%	95.5%	95.0%	95.5%	95.7%	88.6%
	+/-2	95.1%	92.4%	98.6%	98.7%	95.1%	99.2%	99.3%	99.3%	99.5%	97.5%
	>+/-2	96.7%	97.1%	98.9%	99.0%	97.1%	100.0%	100.0%	100.0%	100.0%	98.7%
	noFit	3.3%	2.9%	1.1%	1.0%	2.9%	0.0%	0.0%	0.0%	0.0%	1.3%

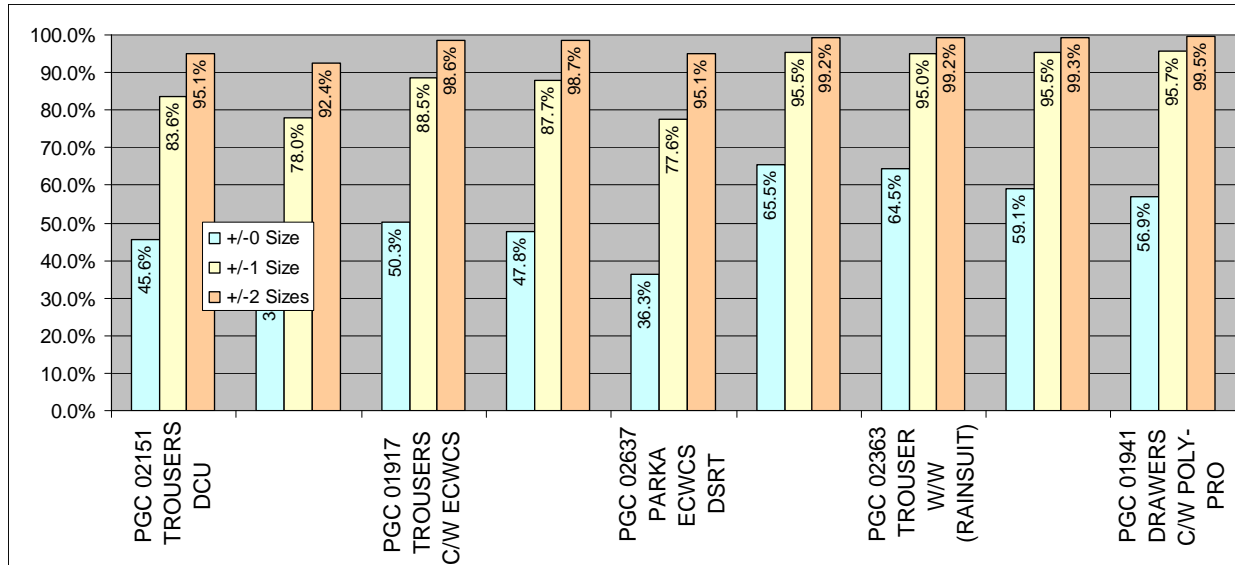


Table 14 – Initial Optimized Fit Rate Evaluation Results

		PGC 01755 BODY ARMOR, FRAGMENTATION PROTECT	PGC 02153 COAT, CAMOUFLAGE PATTERN	PGC 02284 COVERALLS, COMBAT VEHICLE	PGC 02285 JACKET, COLD WEATHER	PGC 02781 BALLISTIC ASSEMBLY, VEST, SMALL AR	TOTAL AVERAGE
Cases	Total	1298	1298	1298	1298	1289	1296
	noData	128	128	128	128	128	128
	noSize	897	760	897	896	493	788.6
	Fit	269	397	269	264	668	373.4
	noFit	4	13	4	10	0	6.2
Width	+/-0	50.5%	49.8%	57.1%	49.3%	51.9%	51.7%
	+/-1	93.4%	90.7%	95.2%	87.6%	94.6%	92.3%
	+/-2	98.5%	96.6%	98.5%	96.4%	99.3%	97.9%
	>+/-2	98.5%	96.8%	98.5%	96.4%	100.0%	98.0%
Length	+/-0	69.2%	39.3%	42.5%	62.4%	100.0%	62.7%
	+/-1	98.5%	89.8%	90.1%	94.2%	100.0%	94.5%
	+/-2	98.5%	96.8%	98.5%	96.4%	100.0%	98.0%
	>+/-2	98.5%	96.8%	98.5%	96.4%	100.0%	98.0%
Total	+/-0	33.7%	23.4%	23.8%	33.2%	51.9%	33.2%
	+/-1	82.1%	61.2%	70.3%	71.9%	94.6%	76.0%
	+/-2	97.4%	88.8%	92.7%	92.3%	99.3%	94.1%
	>+/-2	98.5%	96.8%	98.5%	96.4%	100.0%	98.0%
	noFit	1.5%	3.2%	1.5%	3.6%	0.0%	2.0%

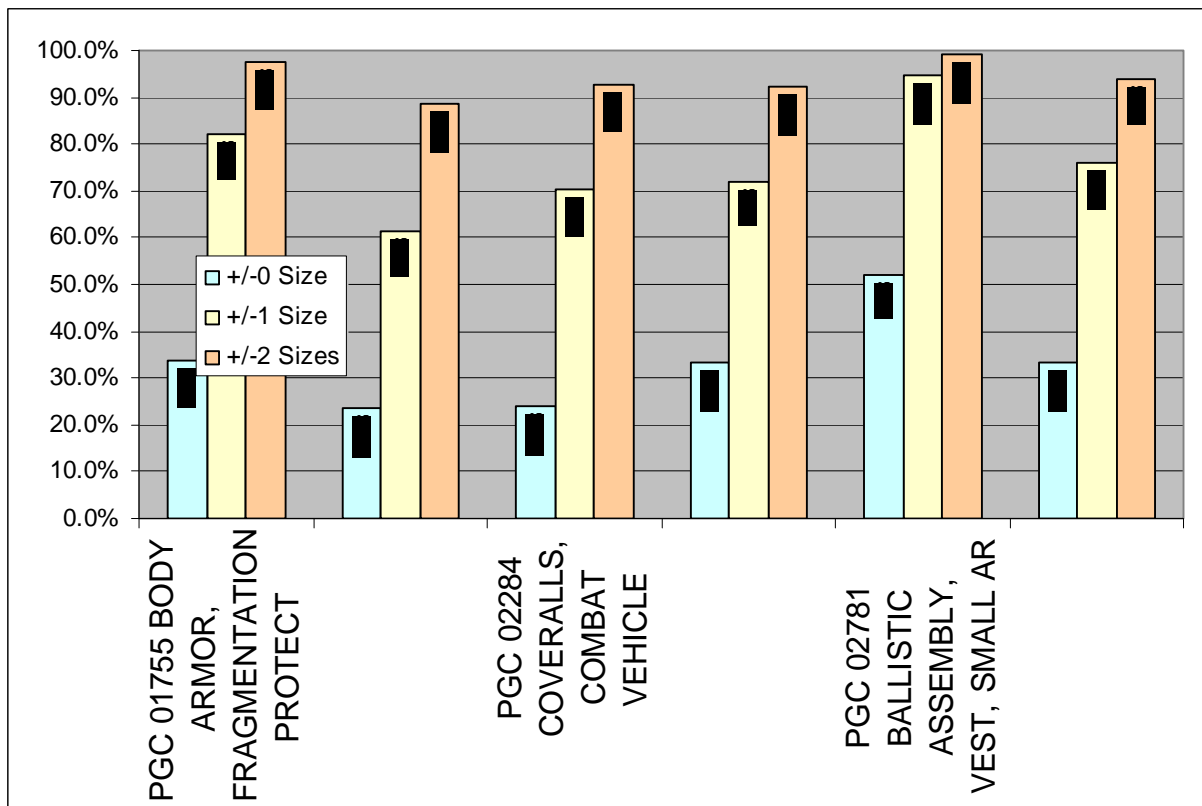


Table 15 –Additional Items Optimized Fit Rate Evaluation Results

5.6.8 Final Size prediction configuration

The following table shows the final fitting rates. It can be observed that the fitting rates increased compared to the previous ones.

For the items not listed below but mentioned in the “additional items” list above, not sufficient numbers of data sets were available.

In the table below fitting rates are given for each dimension of the sizing system and the total. E.g., for a parka, the 1st size dimension is the chest girth, the 2nd size dimension the body height. The respective percentage shows how good the fitting rule is to predict that size dimension. The total gives the resulting fitting rate for that item. Therefore, the row “Size Dim. 2” of single-sized items is empty.

Table 16 – Fitting Rates By Sizes

		UNDERSHIRT C/W POLY- PRO	DRAWERS C/W POLY- PRO	PARKA W/W (RAINSUIT)	TROUSER W/W (RAINSUIT)	TROUSERS C/W ECWCS	PARKA C/W ECWCS	PARKA ECWCS DSRT	TROUSERS DCU
Cases	Num Fit Assessments	777	773	783	784	2761	2780	138	118
Size Dim. 1	+/- 0	64,7%	65,5%	52,6%	68,9%	70,7%	70,1%	74,5%	83,1%
	+/- 1	97,9%	98,1%	95,3%	99,1%	99,8%	99,4%	99,3%	100,0%
	+/- 2	100,0%	100,0%	99,7%	99,6%	100,0%	100,0%	100,0%	100,0%
	> +/- 2	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Size Dim. 2	+/- 0					63,3%	79,5%	65,7%	70,3%
	+/- 1					94,5%	100,0%	95,6%	95,8%
	+/- 2					99,9%	100,0%	100,0%	100,0%
	> +/- 2					100,0%	100,0%	100,0%	100,0%
Total	+/- 0	64,7%	65,5%	52,6%	68,9%	56,0%	56,7%	60,6%	66,1%
	+/- 1	97,9%	98,1%	95,3%	99,1%	77,6%	92,5%	79,6%	86,4%
	+/- 2	100,0%	100,0%	99,7%	99,6%	94,6%	99,8%	94,9%	96,6%
	> +/- 2	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

		TROUSERS ECWCS DSRT	SHIRT C/W BLK FLEECE	OVERALLS FLEECE BLK	LINER, COLD WEATHER COAT	BODY ARMOR, FRAGMENTA TION PROTECT	OVERALLS, COMBAT VEHICLE CREWMEN	TROUSERS, COMBAT	COAT, COMBAT
Cases	Num Fit Assessments	137	1898	1881	450	178	16	13	12
Size Dim. 1	+/- 0	74,5%	63,6%	61,4%	75,6%	74,2%	68,8%	76,9%	75,0%
	+/- 1	99,3%	98,2%	94,1%	100,0%	98,3%	98,8%	100,0%	100,0%
	+/- 2	100,0%	99,8%	98,7%	100,0%	100,0%	100,0%	100,0%	100,0%
	> +/- 2	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Size Dim. 2	+/- 0	63,5%		83,0%	83,5%	84,3%	68,8%	69,2%	75,0%
	+/- 1	95,6%		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
	+/- 2	100,0%		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
	> +/- 2	100,0%		100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Total	+/- 0	59,1%	63,6%	53,1%	75,6%	64,0%	62,5%	53,8%	58,3%
	+/- 1	78,8%	98,2%	86,9%	83,5%	92,7%	75,0%	92,3%	91,7%
	+/- 2	94,9%	99,8%	98,1%	100,0%	100,0%	93,8%	100,0%	100,0%
	> +/- 2	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

		JACKET, FLYER'S	LINER, FLYER'S JACKET	COVERALLS, COMBAT VEHICLE CREWMEN GREEN	JACKET, COLD WEATHER	COAT, CAMOUFLAG E PATTERN	BALLISTIC ASSEMBLY, VEST, SMALL AR	DRAWERS, EXTREME COLD WEATHER	UNDERSHIRT , EXTREME COLD WEATHER	Total Average
Cases	Num Fit Assessments	11	10	178	194	125	1272	757	565	475
Size Dim. 1	+/- 0	100,0%	50,0%	68,0%	74,2%	65,6%	64,4%	62,1%	49,9%	68,9%
	+/- 1	100,0%	100,0%	96,6%	99,0%	100,0%	98,6%	99,5%	99,3%	98,6%
	+/- 2	100,0%	100,0%	100,0%	100,0%	100,0%	99,8%	100,0%	100,0%	99,9%
	> +/- 2	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
Size Dim. 2	+/- 0	81,8%	60,0%	60,1%	83,5%	46,4%		84,5%	92,7%	73,1%
	+/- 1	100,0%	100,0%	92,1%	99,5%	88,8%		100,0%	100,0%	97,9%
	+/- 2	100,0%	100,0%	100,0%	100,0%	100,0%		100,0%	100,0%	100,0%
	> +/- 2	100,0%	100,0%	100,0%	100,0%	100,0%		100,0%	100,0%	100,0%
Total	+/- 0	81,8%	20,0%	47,8%	68,6%	33,6%	64,4%	55,4%	47,3%	40,0%
	+/- 1	100,0%	90,0%	76,4%	89,2%	68,8%	98,6%	90,9%	95,0%	61,0%
	+/- 2	100,0%	100,0%	93,8%	99,0%	98,4%	99,8%	99,9%	99,6%	67,5%
	> +/- 2	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	68,6%

The question remains if the achieved fitting rates can be improved and if yes by what means and effort and how much they can be increased. The short answer is: we believe that the fitting rates can be improved, but we do not know by how much.

The crucial point is that the data used to calculate the parameters for the fitting rules must be collected under more controlled conditions as they are currently. A common sense about what a correct fit is must be defined and during data collection it must be guaranteed that only sizes that fulfill these definitions of a correct fit are issued.

As an example, experience was gained from another project when Human Solution was partner in the "Uniform system for Improved Tariff" program (USFIT). The objective of USFIT was to integrate 3D body scanning technology into the existing clothing sizing and issue process at selected Clothing and Issue Facilities of the U.S. Army (CIF), obtain 3D scans on every soldier in order to collect consistent and accurate measurements for each soldier, use these measurements to improve the accuracy of clothing size selection and to provide an improved tariff for procurement, and to use the 3D scans at a later date for relevant body size information.

The data for setting up the size prediction rules were collected with help of trained fitters and clearly and objectively defined fit criteria. Those data resulted in direct hits of around 70% - 75%, for +/- 1 sizes around 80% – 95%.

5.6.9 Additional Variables Affecting the Size Selection

Size prediction is a multivariate classification problem, influenced by various factors beside body measurements. Influencing factors on size selection and fit of garment items are identified in the following figure.

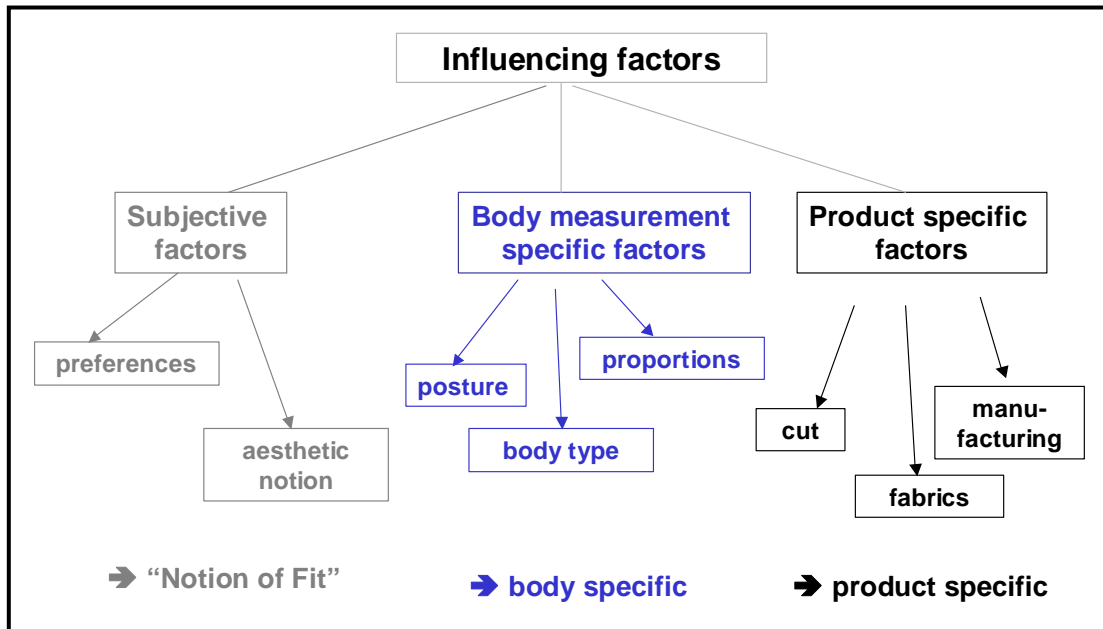
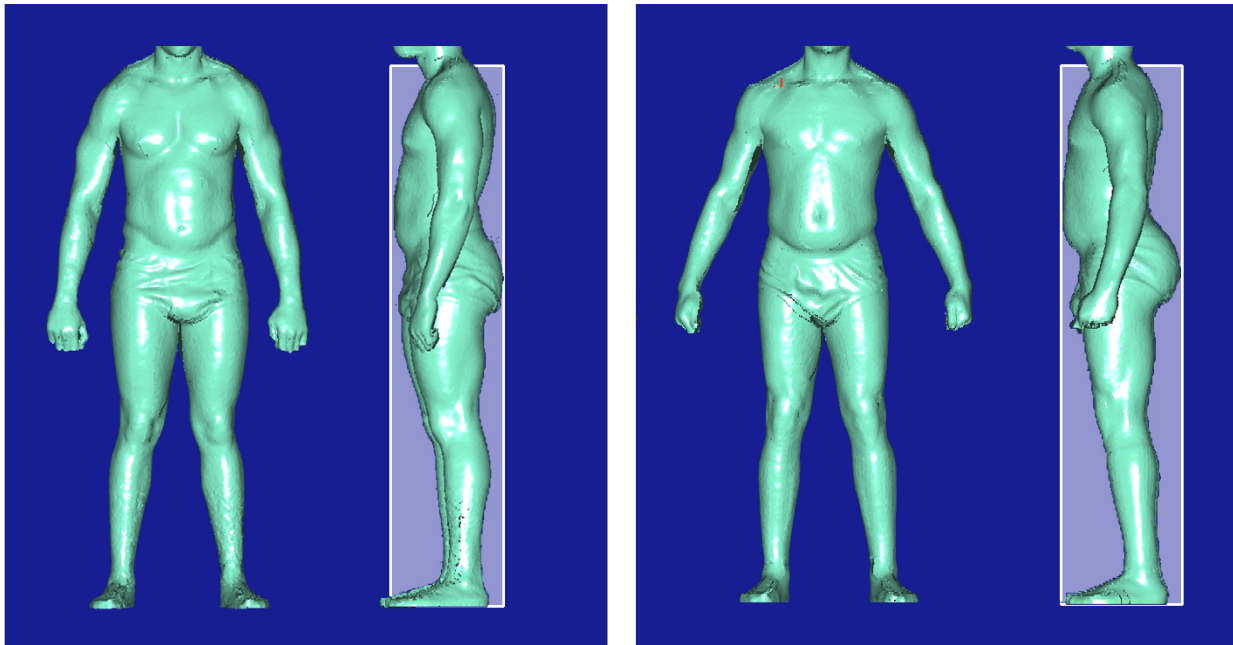


Figure 27 - Driving Factors Of Influence On Garment Size Selection

The two main influencing factors are body proportions and the soldier's posture as well as the design, i.e., the concept of fit of the garments. In the military area subjective factors like personnel preferences and aesthetic notion can be disregarded.

Body proportions and the subject's posture strongly influence the selection of the best fitting size. Two subjects may have nominally identical body dimensions but one may have a different body shape or posture. Both subjects may not fit into the same garment size.

This is illustrated in the following figure. Although the two recruits had nearly identical body measurements, the recruits were issued a different size for the Men's Coat. The first recruit was issued "39L" the second a "40L".



**Figure 28 - Male Scans With The Same Body Measurements, But Different Body Shapes
(Height 175 cm, chest girth 98,5 cm, waist 82 cm, hip girth 100 cm).**

6.0 Summary Of Results Achieved, Lessons Learned & Benefits

6.1 Summary of Results Achieved & Lessons Learned

6.1.1 3D Whole Body Scanning Results at Ft. Carson

The results can be split up between outcomes installing the body scanner and outcomes integrating the body scanner technology into the ARN-IRM system at Ft. Carson.

6.1.1.1 Scanner Installation & ARN-IRM System Integration at Ft. Carson

The project team worked with personnel at Ft. Carson to modify the Clothing Issue Facility operations with the incorporation of the 3D Whole Body scanner and the integration to the ARN-IRM systems. Key elements of this activity are summarized as follows:

- Installed the Human Solutions VITUS/Smart hardware and software at Ft. Carson taking into account special requirements of the existing issue line and available floor space. The operational concept and process takes into account that female recruits can be integrated into the whole body scanner process at a later time.
- Linked Human Solutions VITUS/Smart 3D Whole Body scanning capabilities to ARN Integrated Retail Module (ARN-IRM) information systems for soldier data captured by local personnel. This included linking data collection to ARN systems using scan forms and electronic filing software to capture issues at Ft. Carson. On that basis, recommendations were developed to integrate automatic uniform sizing results into the existing ARN SCM solution.
- Implemented and set-up an ARN Local Area Network (LAN). Provided interfaces for integration and linking of Human Solutions VITUS/Smart technologies into operational processes at Ft. Carson, and into ARN IRM Supply Chain Management (SCM) systems (outside the fire wall of Ft. Carson and existing 'legacy' systems).
- Developed and integrated the Merlin System as the interface software between ScanWorX and ARN-IRM for passing soldier information to

ScanWorX, and receiving the measurement extraction and size prediction information into ARN-IRM.

- Developed and implemented a database to database exchange of essential data between CIF-ISM and ARN-IRM. The sharing of property book, menu, and clothing record data enables source data automation by ARN-IRM and transfer of issue data to update ISM on a real-time basis. The ARN R&D effort proved the concept of data exchange and provides ISM with an automated front-end that saves time in soldier issues and other transactions, and reduces the data handling workload of the staff at the Ft. Carson CIF.

6.1.1.2 Summary of Automatic Size Prediction at Ft. Carson

In order to implement an automatic size prediction for the 3D Whole Body Scanner technology the following steps were conducted and results achieved:

- Identified items to be integrated into the size prediction algorithm.
- Analyzed technical specifications and fit manuals in order to understand and consider fit-philosophy of items.
- Developed a size selection algorithm based on the technical specification in order to compare real fit data and fitting rates with theoretical ones.
- Conducted initial data collection, i.e. sample fit-data and body dimensions that were used for a first size selection algorithm.
- Showed that an immense improvement in fitting rates could be achieved. The improvement was based on comparison between the size selection algorithm in the technical specification and the one based on the initial data collection. That means that only a small percentage, a maximum of 25% of the issues is made in accordance with the initial intent of the designers.
- Using the size prediction version, based on the initial data collection, more body dimensions and fit data were sampled. Also, it was decided to include more items into the size prediction algorithms. Those items are referred to above as the “additional items”.
- The size prediction items were optimized repeatedly, and installed at the issuing point until a final version was developed.

- Some items are issued for which there is not enough sample data during the course of the project. Therefore, no automatic size prediction algorithm could be developed for those items.

6.2 Summary of Benefits Achieved with Use & Integration of 3D Scanning

The following benefits could be achieved:

- Implemented all components of the ARN IRM at Fort Carson including interface with the Human Solutions VITUS/Smart 3D Body Scanner. The VITUS/Smart 3D Body Scanner is capable of scanning both male and female soldiers;
- Implemented issue scan forms for various menus and modified those scan forms to capture “new” versus “used” items issued to the soldiers, and automatic update of the soldier clothing record, providing a faster and less error-prone approach to source data capture. Gained visibility of ARMY-owned assets for both new and used organizational items managed at Fort Carson;
- Integrated the data from the Soldier Check-in process into ARN-IRM to create the desired demographic data that is then used as part of the development of a dynamic local tariff;
- Instituted new size prediction algorithms to guarantee a functional fit and uniform look of soldiers. Developed size selection tables for automatic prediction of garment size for organizational clothing items based on the body measurements extracted from the 3D Whole Body Scans;
- Repeatedly optimized the size prediction, and repeatedly installed at the issuing point until a final version was developed, demonstrating great improvement in fitting rates;
- Optimized the Ft. Carson CIF operation by establishing automatic size prediction, which supports demand driven supply chain management;
- Developed additional Virtual Item Manager (VIM) functionality to allow the end users to generate customized local tariff reports to include groupings by gender, MOS and current status (Active/Reserve/National Guard); and,
- Implemented the necessary integrated tools to better manage the organizational clothing assets at the CIF, Ft. Carson.

6.3 Acceptance of the system at Ft. Carson

Phone interviews were conducting at intervals throughout the project, culminating in an in-person interview with the entire CIF chain of command at Ft. Carson on June 19, 2007. Included were Dale Caddick, Renee Weatherby, and Ted Schneider, director of logistics. All throughout the project HUMAN SOLUTIONS received positive feedback on the system, with reports that it sped up the processing time for soldiers, and assisted in providing scan forms with the best choices pre-highlighted for easy marking.

This was confirmed in the June 19 meeting with the entire staff. They in fact expressed great interest in expanding the capabilities of the system to provide even more benefits, such as scanning females or expanding the item list.

Therefore, we may regard the base acceptance and approval is and has remained high for this installation, even with relatively little maintenance.

7.0 APPENDICES

Several appendices are attached to provide additional reference materials related to this project.

Appendix A – Definition of Terms & Acronyms

The following acronyms are used in this report and are provided to provide clarity of understanding for the reader.

- ◆ **ARN** – Apparel Research Network made up of selected industry and academic partners working together to develop innovative solutions for the Apparel industries support of military departments.
- ◆ **ASTRA** - ARN Supply-chain Transaction Repository Audit.
- ◆ **C&T** – Clothing and Textiles Division of the Defense Supply Center Philadelphia.
- ◆ **CIF** – Central Issue Facility
- ◆ **DOS** – Day Of Supply.
- ◆ **DSCP – Defense Supply Center Philadelphia** - DSCP controls the procurement and distribution of Medical, Subsistence (i.e., food), and Clothing and Textiles commodities to Defense Logistics Agency (DLA) depots and stock record accounts, worldwide.
- ◆ **ESOC – Emergency Supply Operations Center** – This refers to orders that are processed through the Emergency Supply Operations Center at DSCP. ESOC orders processed for different sites are now handled via contractor support as part of regular maintenance support for customers using the ARN VIM/Wholesale Local systems.
- ◆ **HHT** – Hand-Held Terminal
- ◆ **MCRD-PI** – Marine Corps Recruit Depot – Parris Island
- ◆ **MILSTRIP** – Military Standard Replenishment System
- ◆ **NAP** – Network Access Point
- ◆ **NSN** – National Stock Number
- ◆ **OCIE** – Organizational Clothing & Equipment
- ◆ **OL** – Operating Level

- ◆ **OST** – Order Ship Time
- ◆ **QDR** – Quality Deficiency Report. These are used to track items that are outside acceptable standards for issue to recruits. These reports provide for communication with DSCP Item Managers regarding problems of quality that are encountered.
- ◆ **QLM** – Quality Logistics ManagementTM – Material Management inventory system supporting acquisition, issues and distribution and predictive forecasting.
- ◆ **QLM/Local** – The QLM software implemented as a “wholesale local” inventory management system supporting acquisition, distribution and predictive forecasting at Ft. Leonard Wood as a prototype for future sites. The system provides a “local” capability to manage wholesale inventory assets located at the CIIP including receipt and inventory adjustment processing.
- ◆ **RIC** – Routing Identifier Code – Refers to a code used in SAMMS for identification of location where materials are to be shipped.
- ◆ **RTC** – Recruit Training Center (includes Army CIIPs) – These are the facilities operated by the different departments of the military where new recruits are inducted for basic training.
- ◆ **SAMMS** – Standard Accounting and Material Management System - This system is used by the Defense Logistics Agency, Defense Procurement Support Center.
- ◆ **SSN** – Social Security Number – nine (9) digit number to identify a recruit
- ◆ **SWX** – Human Solutions’ scan, body measurement extraction and and size prediction software ScanWorX
- ◆ **System Change Requests (SCRs)** – SCRs refer to the process and procedures that are used to track requested revisions to systems software as enhancements are requested or operational “software bugs” are identified during testing or use in production. These are tracked and managed through a system used to record: System Change Request title/description; detail/describe changes requested; points-of-contact; authority for approval/denial of SCR; programming assignments; and

tracking of disposition resulting (acceptance/rejection) of requested change(s) to program(s).

- ◆ **VB** – Visual Basic
- ◆ **VIM** – The Virtual Item Manager (VIM) system incorporates operational data extracted from the SAMMS Clothing & Textile (C&T) server as the basis for the operational and decision support capabilities provided in a single source of information for Item Managers at the retail (Recruit Training Centers) and wholesale (DSCP) level.
- ◆ **VIM/WL** – VIM Wholesale Local

Appendix B – Project Personnel

The following personnel were involved in various phases or tasks for this project. Each of these individuals played key roles and worked closely together in achieving the desired results from the integration of the 3D Whole Body Scanners to ARN VIM – IRM system and evaluation of the results. The Project Team members are grateful for the contribution and support of the personnel at Ft. Carson who contributed their support to this research effort.

Jochen Balzulat – Human Solutions of North America, Inc.
Robert E. Bona – AdvanTech Systems Design Engineer
Dennis E. Brekhus – AdvanTech Assistant Project Manager
David Crutchfield – AdvanTech Customer Services Engineering
Doug D. DeLoach – Advantech
Helga Gäbel – Human Solutions GmbH, Germany
Ulrike Grün – Human Solutions GmbH, Germany
Michael van Genabith - Human Solutions of North America, Inc.
Guido Hansen – Human Solutions GmbH, Germany
Bernie Johns – ARN Project Support
Frankie M. Mason – AdvanTech Network Systems Administrator
Robert J. Padilla – Advantech Senior Trainer
Richard A. Perrin – AdvanTech Project Manager
Anke Rissiek – Human Solutions GmbH, Germany
Jochen Schneider – Human Solutions GmbH, Germany
Essie Smith – Ft. Jackson CIIP Supervisor
Michael Stöhr – Human Solutions GmbH, Germany
Rainer Trieb – Human Solutions GmbH, Germany
Julie Tsao – ARN Project Manager, DLA
Roy Wang – Human Solutions of North America, Inc.
Debra L. Wassel – AdvanTech Technical Support

Appendix C – Overview of CIF Operation, Ft. Carson, CO

1. Introduction.

This CIF is both a mobilization and demobilization station. It serves 35,000 Active, Reserve and National Guard military personnel.

CIF facilities include the following buildings: 330 – CIF OCIE and OCIE repair, Central Receiving Point, Installation Property Book; 309 – CIF warehouse for storage and large-unit-issue of Desert Camouflage Uniforms (DCUs); 20,000 CIF warehouse near Peterson AFB; 520 – CIF warehouse; 8000 – ITT operated facility for canvas and overflow OCIE repair.

The CIF is contractor-operated by 21 employees: Reception: 2; Turn-In: 5; Store: 2; Classification: 1; Storage: 12. 6 ITT employees.

2. Financial.

Following development of “Menu” of items for each Unit/MOS by the “Menu Board,” units transfer funds to DOL and CIF based on their percentage of total base personnel. Also, a calculation is made of the washout rate of items and non-returns. This calculation is divided by total dollars to determine if the unit owes additional Dollars. The Ft. Carson Director of Resource Management (DRM) (accounting office) tracks Unit payments.

3. Property Book Officer (PBO) and Functional Administrator.

The PBO works closely with the contractor in determining requirements, asset visibility, declaration of excess, and replenishment. The Functional Administrator duties include:

- Coordination of technical issues with ISM, Ft. Huachuca, and the DOIM at Ft. Carson.
- Record management in ISM for the PB. Removes Due Outs for units that have deployed.
- Menu changes based on directions from the Menu Board.
- Set up of Special Menus.

- Inventory Adjustment Report (IAR) and Administrative Adjustment Report (AAR) changes in PB (ISM) in the presence of the contractor.
- Processes security password requests to DOIM and Ft. Huachuca.
- Sets authorization for the password in ISM.
- Produces routine, special, and statistical (metrics) reports, labels for issue files, and End of Day closeout.

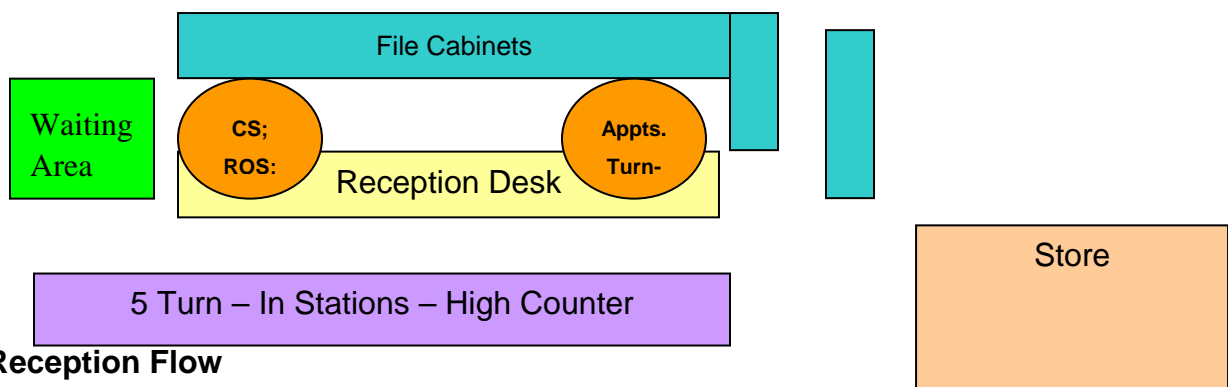
3. Requisitioning and Excess.

The contractor conducts daily computations on each item, based on information in ISM, to determine assets and requirements. The requirements are reviewed by the PBO and new projects or contingencies are factored into the calculation. Requisitions are prepared using the appropriate fund codes provided by DRM. The requisition priority is entered, three copies of the requisition are produced – copy to SARSS, copy to DRM, and in the instance of immediate need a copy would go to Envision, on-post contractor that fill the order.

Asset calculation: On Hand minus Laundry minus Repair minus Suspense minus On-Loan equals Available for Issue (AFI). After this calculation and determination of contingency needs, some stock may be declared excess.

4. General Flow for Turn-Ins and Issues

Individuals or units must make advance appointments for full turn-ins. The first stop is Reception (and the Installation Support Module (ISM)) to create a clothing record or obtain a previously created clothing record to be used as a worksheet. Individual then goes to one of the five Turn-in stations or to the Store (for issues). All are in close proximity to one another as illustrated here.



5. Reception Flow

Units and individuals destined for the Store (Issue) go through the Welcome Center for a briefing on the CIF. All units and individuals meet with one or both of the two Receptionists prior to issue, turn-in or direct exchange.

Functions include:

- Maintaining file folders arrayed in file cabinets directly behind the reception area. Active duty soldiers are filed alphabetically; Guard and Reserve are filed by unit.
- Cash Sales, Statement of Charges, and Report of Survey, use and update of the ISM as the basis for preparation of paperwork for soldier direct exchange, turn-ins and issues.
- The Ft. Carson Menu Board (Commanders and Staff elements) has prepared 14 basic menus to be issued to soldiers, and, based on UIC/MOS needs, have approved modifications creating a total of 207 menus at Ft. Carson. These menus are resident in ISM.
- Process individuals/units for Direct Exchange of OCIE. (Approximately a 1 minute process)
- Print clothing record worksheet for exchange of sub-standard item, and pickup of replacement item. Refer to Ft. Carson CIF Procedures, SU-CI-P04, Direct Exchange Operations, and SU-CI-P07, CIF SOP, in ARN's Ft. Carson list of documents.
- Process individuals/units for Turn-in of OCIE. Refer to Ft. Carson CIF Procedures, SU-CI-P03, Process Equipment-Turn-in, and SU-CI-P07, CIF SOP, in ARN's Ft. Carson list of documents. (Approximately a 3 - 4 minute process) Receptionist abstracts/keys line by line in ISM.
 - **Intra-Post Transfer:** access ISM clothing record, select menu for soldier's new unit, key in "carry forwards" from old record, replace old record, identify partial turn-ins if any, print worksheet for partial turn-in of OCIE.
 - **Inter-Post Transfer (PCS):** access ISM clothing record, key in items to "carry forward" to new duty station, and print worksheet for partial turn-in of OCIE, and print copy for hand carry and file.
 - **Full Turn-ins:** full turn-in has priority; access ISM clothing record, and print worksheet for turn-in of OCIE, and print copy for hand

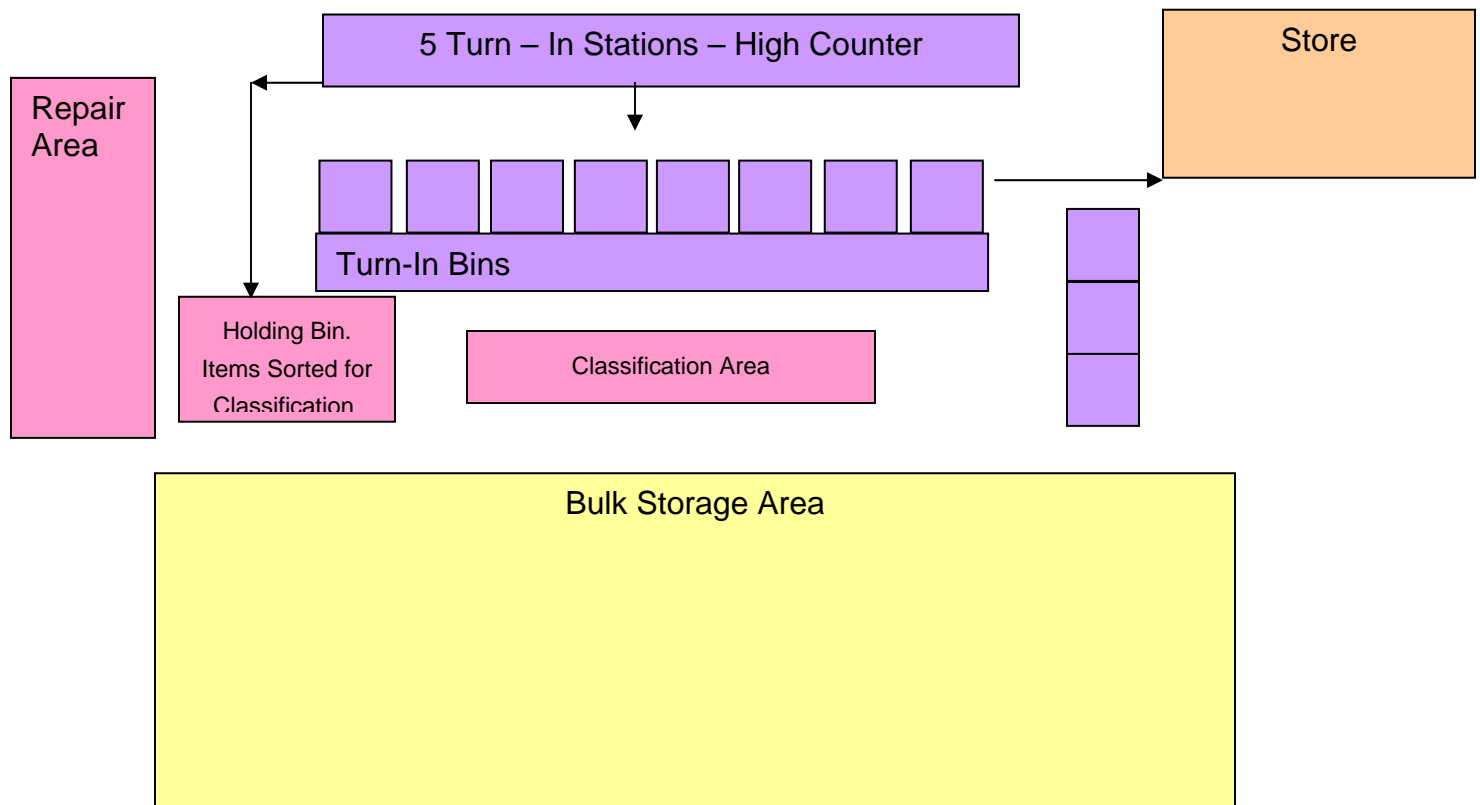
carry and file. (Approximately 3.5 minutes for 45 line turn-in)

- **Abstracting after Turn-in:** Receptionist abstracts line by line in ISM to identify all items turned in, to correct size codes that differ from issue to turn-in, and to identify shortages. If a shortage, individual must return with Statement of Charges, a Report of Survey, or the item. If two of the same item are turned in and each has some change to be made, e.g. size code, the receptionist must access the record twice and abstract twice.
 - **Clearance:** After a record is abstracted with no shortages the receptionist signs and stamps clearance on all copies of the clothing record and file. Stamps clearance document, gives copy of record to individual, and puts copy in the file folder and returns file to file cabinet.
- Process individuals/units for Issue of OCIE. Refer to Ft. Carson CIF Procedures, SU-CI-P02, Issue Equipment, and SU-CI-P07, CIF SOP, in ARN's Ft. Carson list of documents. (Approximately a 2 minute process)
- **Reception selects a "menu"** from ISM for individual soldiers, based on their UIC/MOS.
 - **Full Issue:** access ISM clothing record, select menu for soldier's new unit, print worksheet for partial issue of OCIE at the Store.
 - **Intra-Post Transfer:** access ISM clothing record, select menu for soldier's new unit, key in "carry forwards" from old record, replace old record, identify partial issue if any, print worksheet for partial issue of OCIE at the Store.
 - **Inter-post transfer:** ISM does not yet provide visibility (new web-based enhancement will) of the clothing record and the "Carry Forward" items from another installation. The soldier may or may not have paper showing "Carry Forward" items. If paper is available Reception accepts "Carry Forward" figures and enters in the new Ft. Carson clothing record for the individual. Print Issue worksheets for soldiers to hand carry to the Store to obtain their OCIE.

6. Turn-In & Classification Flow

- **There are 5 turn-in stations** at the high counter illustrated below. Normally no more than two stations are operating. For large unit issues

cross-trained employees man all 5 stations. There is an exact time and schedule of individuals and units each day.



- **Employees sort like items** into bins directly behind the line. Items needing cleaning, repair, or disposal are sorted to Classification. It takes an average of 15 minutes to check each item, but the objective is to complete each individual within one hour.
- **Documentation of turn-in** is the Generic Worksheet with all the items (menu) applicable to the soldier, and a CTA 50-900 Clearance Certificate & Turn-In, FC Form 26E. The Worksheet shows number of items authorized and issued, and is quantities are written to show turn-ins. Deficiencies of any kind are noted on the FC 26E and hand carried to Reception to determine if all items are acceptable and accounted for, permitting Clearance.
- The **Classifier evaluates each item** placed in K status by Turn-in, (laundry, repair, or DRMO) and directs the items to the appropriate location, preparing necessary documents. DRMO will soon go on-line and a transaction will be returned promptly for use in dropping item(s) from

inventory. Since laundry and repair items require a very short time to process they are not entered into ISM as unavailable for issue.

- **Repair.** Items are transferred to repair and sewing on a FC 2407. Priority of repair is set based on the stock status and missions. Additional repair capability is available in Bldg. 8000 where ITT Federal repairs tents and other canvas items. Most items are returned to stock in approximately an hour. All items are returned to stock within 24 hours.
- **Return CC “B” to Issue.** The same day, Turn-In Clerks fold/prepare serviceable/clean items as necessary, deliver to the Store, and place on shelf/bin IAW proper Line Item Number. Items that cannot fit on the Store shelves are boxed and given to the Warehouse employees to place in bulk storage bins.
- **Inventory is in limbo a very short time,** but the turn-in process could benefit from source data automation. Scan forms or HHT could be used to track turn-ins across the counter to CC “B” and back to issue, to “K” status with further scanning into laundry, repair, or DRMO.

7. Issue Stations - OCIE Flow

- **Soldier receives Issue Worksheet** (Menu appropriate to UIC/MOS) from Reception showing all authorized items and quantities, and those items “Carried Forward” from a previous assignment or from another menu. Proceeds to the Issue Stations across the hall, takes a grocery cart and is issued items from the issue bins at issue station starting with the highest Line Item number. This facilitates check out – the items on top of the cart will correspond to the sequence of items on the worksheet. Soldier may spend up to 2 hours finding the right items and right fit, actions the number of each item selected on the worksheet.
- **Proceeds to one of two checkout counters** where the clerks call up the appropriate Menu in ISM for the worksheet. The item quantities are entered one by one for each Line Item in ISM. After checking three or four soldiers, the clerk holds a session with all of them to verify that they have the right items prior to signing copies of the worksheets – copy to soldier, copy to file.
- **This process is also a candidate for scan form or HHT source data capture.** As items are selected they can be identified on a scan form, or scanned with a HHT at check-out as newly issued, “carried forward,” or

short.

- **Bulk Issue.** There are instances when units want to issue the OCIE from an organizational hand receipt to the individual soldier at the unit or the unit's home station. The Unit Bulk Issue Hand Receipt must be cleared by the unit to the individuals' DA 2062s. Most often the quantities on the DA 2062s do not equal the quantities that were issued on the unit hand receipt.

11. Warehousing

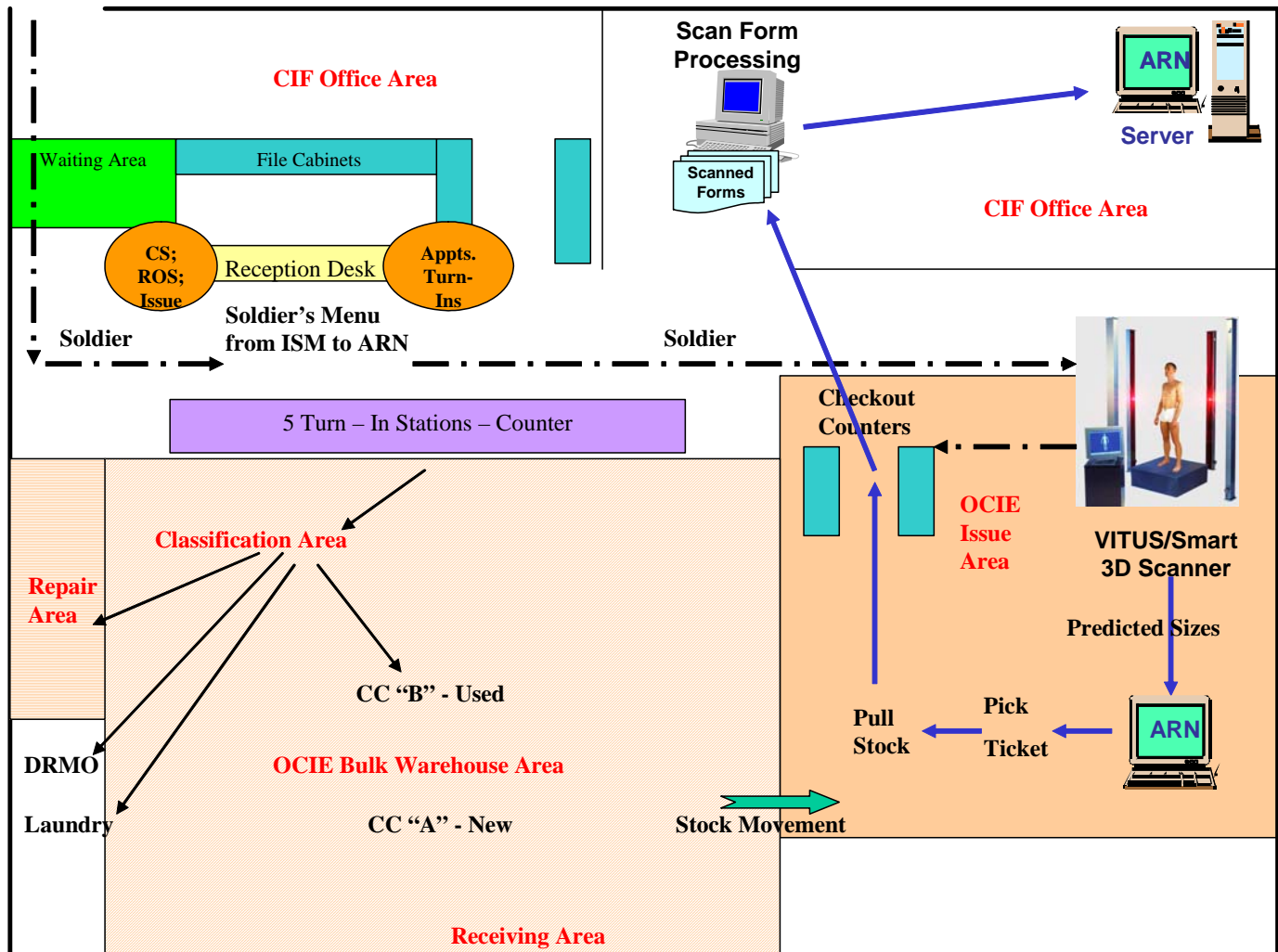
- **Inventory.** CIF shuts down for two days in May for manual physical inventory of Warehouses and Store. Currently, Item Description and Quantity are written on the boxes of items that are sealed for long-term storage. The inventory could benefit from bar code and scanning.
- **Central Receiving Point (CRP).** New procurement is received into Automated Manifest System (bar code scan) in Bldg. 330 at Central Receiving Point (CRP), then delivered to back door of the CIF. The CIF manually enters receipts into ISM from shipping documentation. Shipping documents have bar coding, but the CIF handles receipt of new assets manually. Some of the overflow stock from the CIF is stored temporarily in the CRP area.
- **Bldg. 330.** Bulk stock is stored directly behind the turn-in stations, and adjacent to the Store (issues). There are five aisles. Between these aisles are 10 storage racks – 100 feet long, 5 levels high; each rack is about 5' x 5' providing approximately 9600 square feet of storage. There is no locator system in ISM; it is in an off-line database created by the contractor. All stock is CC "B." Warehouse employees stock the issue bins in the Store as it is needed. No distinction or transaction is made when assets are transferred from bulk to the Store.
- **Bldg. 309.** Desert Camouflage Uniform (DCU) Warehouse. The basic issue of DCUs is made in the CIF, but for a large number of individuals or a large unit, issues are made out of Bldg. 309. The loose items are arrayed in front of storage boxes along a center aisle. As they proceed down the aisle the individuals or units pick up their items by size, checking them off on a Menu worksheet – Boots, DCU tops, Trousers, Field Jacket, Hats. At the other end of the warehouse the issue is verified, signed by the individual – copy to individual; copy to Reception for entry into ISM. Scan forms or HHT scanning would automate the data capture, and save time. Remote location may interfere with a radio frequency HHT scan of

barcode for each item and individual.

- **Bldg. 20000 Area.** This warehouse is designated for excess or obsolete items. The cold weather items stored here were considered obsolete and therefore excess, but by directive, and because of the current, large mobilization they are now being issued before new cold weather items.
- **Bldg. 520. Excess DCUs.** This stock is due to the “push” of War Reserve with a tariff that permitted shipment of small and large sizes in excess of needs. Currently carrying approximately \$1.7 million in excess. Currently do not have enough space to store stock that may be “pushed” for contingencies.

Appendix D - Floor Plan and Issue Process at CIF, Ft. Carson

ARN-IRM Issue Process at Ft Carson Central Issue Facility (CIF)



Appendix E – CIF-ISM and ARN-IRM Interface Requirements

Modernized CIF ISM to ARN-IRM Interface Requirements

July 21, 2004

Requirements

R1. Provide ARN with CIF ISM's most recent menu, soldier, and stock catalog demographics information.

- The available menu demographics are:
 - i. CIF Code
 - ii. Menu Code
 - iii. Menu Description
 - iv. LIN
 - v. Authorized Quantity
- The available UIC-menu cross-reference data are:
 - i. CIF Code
 - ii. UIC
 - iii. Grade Group ID (e.g., E6-, E7+, Officer, Warren Officer, Civilian)
 - iv. Gender
 - v. Menu Code
- The available MOS-menu cross-reference data are:
 - i. MOS
 - ii. Gender
 - iii. Menu Code
- The available soldier personnel information is:
 - i. CIF Code
 - ii. SSN
 - iii. First Name
 - iv. Last Name
 - v. Rank
 - vi. DMOS
 - vii. Gender
- The available stock catalog data are:
 - i. Tag
 - ii. NSN
 - iii. LIN
 - iv. Size
 - v. Nomenclature

- vi. Price
- vii. Unit of Issue
- viii. Total On-Hand Quantity, a sum of the following–
 - 1. Available for issue,
 - 2. To be reclassified,
 - 3. To be disposed,
 - 4. Laundry,
 - 5. Maintenance,
 - 6. Suspense (items shipped to SSA, DRMO, or another PBO via lateral transfer, but haven't been posted as received by the recipient), and
 - 7. Transit out (items shipped to annexes or main, but haven't been received by the recipient) quantities.
- ix. Quantity Possessed by Soldier – clothing records
- x. Quantity Possessed by Soldier – hand receipts
- xi. Quantity Due In from Requisition.

R2. Provide the ability for CIF ISM to receive initial issue data sent from ARN. The initial issue data feed from ARN to CIF contains only soldiers who don't have a clothing record in the ISM database but whose personnel information is available in the ISM database via, for example, an eMILPO feed. Data elements in the data feed sent from ARN to CIF ISM are:

- CIF Code (required)
- SSN (required)
- First Name (required)
- Last Name (required)
- Initial Issue Date (optional)
- Menu Code (optional)
- NSN Issued (required)
- Authorized Quantity (required)
- Quantity Issued (required)

R3. Once an initial issue transaction data feed from ARN is validated and accepted by CIF ISM, the system must generate a clothing record for each soldier in the data feed,

generate an initial issue document for each transaction, update the property book and daily transaction register accordingly.

Assumptions (Interface)

- This interface is a two-way flow from ARN to modernized ISM and vice versa.
- The ARN will provide initial transaction data on a daily basis as a batch process.
- The feed from modernized ISM to ARN will be a batch process running daily on weekdays. The data feed from ISM will be a complete dump of all the applicable data.
- The ARN to modernized ISM interface will utilize the current architecture for interfaces.
- Data exchange between both systems will be using ASCII delimited files, in a pre-defined format.
- A dedicated external interface server located at the master ISM site is the access point for sending and receiving files associated with interfaces between ISM and ARN.
- The file transfers will be done using Secure Shell Protocol 2 (SSH2).
- ARN will initiate all file transfers; ARN will send data files to the modernized ISM by pushing the files and will extract data files from ISM, using specified directory in the dedicated external interface server.
- Modernized ISM will archive the data feed for no more than 7 days.

Assumptions (Data From ARN to CIF ISM)

A1. Soldiers in the ARN initial issue data feed have no clothing records in the ISM database.

A2. Each soldier's initial issue data in an ARN data feed will be validated before it's accepted by the ISM application.

A3. CIF ISM will accept a soldier's initial issue data provided all the criteria listed below are met:

- The soldier doesn't have a clothing record in the ISM database,

- The soldier's personnel information is available in the ISM database (via eMILPO, for example), and
- Every NSN associated with the soldier's initial issue data is stocked at the issuing CIF according to the ISM database.

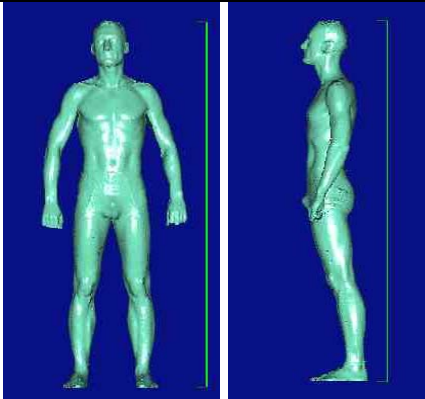
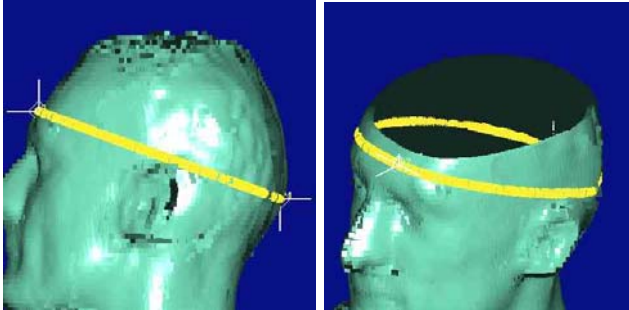
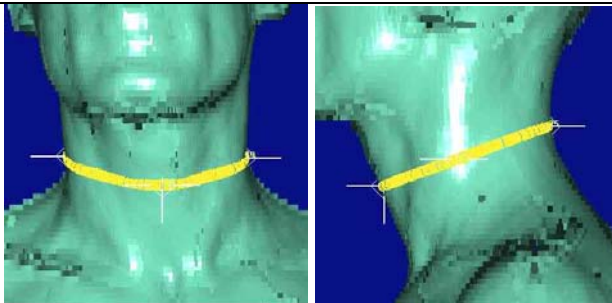
A4. Once ISM is updated with soldier's initial issue data from ARN, the CIF user will be unable to tell if a soldier received an initial issue via an ARN feed or via a regular ISM initial issue transaction. However, CIF users can write an ad hoc query to determine the source of the transaction.

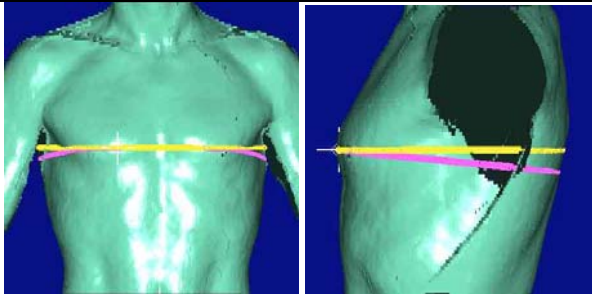
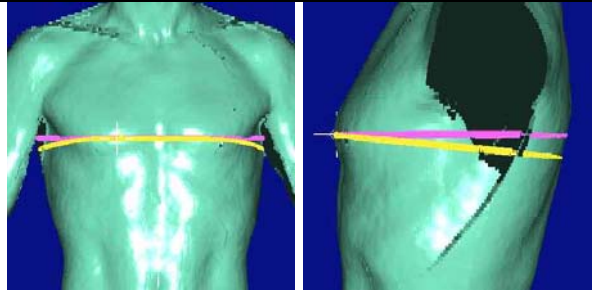
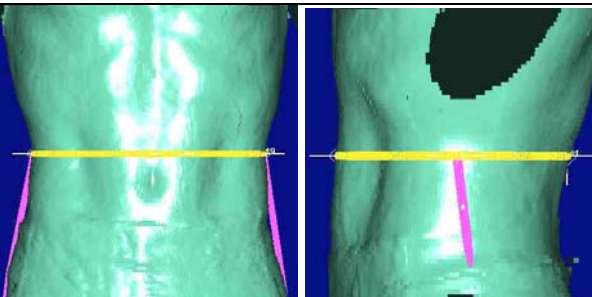
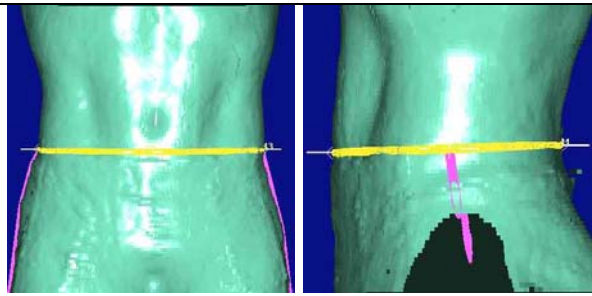
A5. Rejected initial issue data will be sent back to ARN in the same format as received, with an additional reason field.

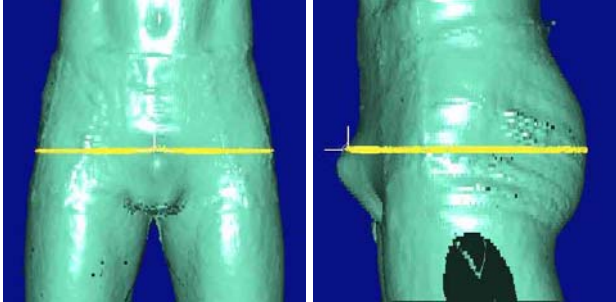

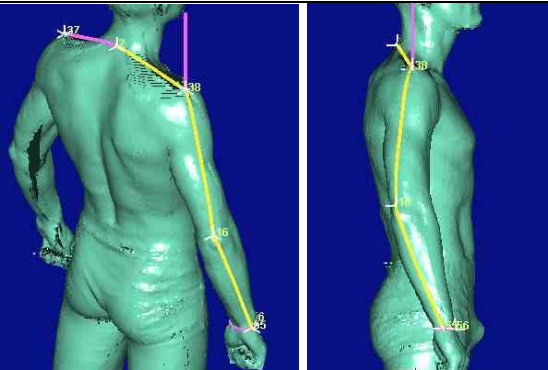
A6. Any invalid menu code information in the ARN-to-CIF feed will either be replaced by a generic menu code or be left blank.

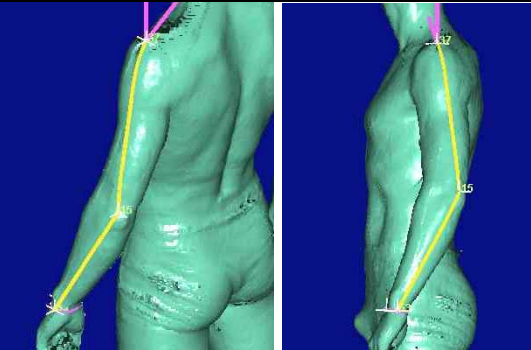
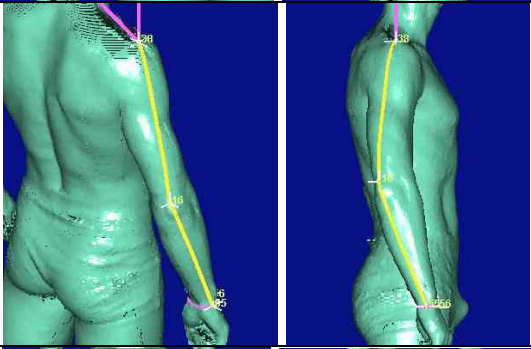
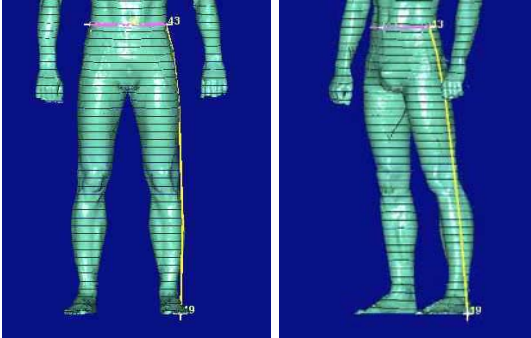
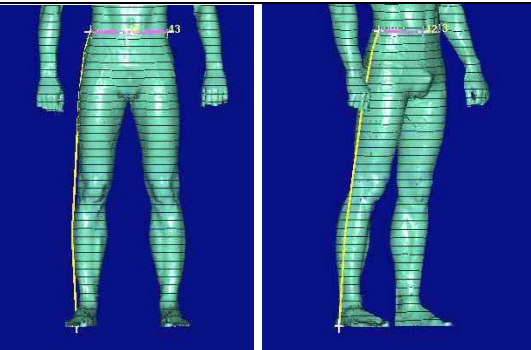
A7. Any discrepancy in the property book which results from rejected initial issue records will not be resolved until the records are corrected and resent from ARN.

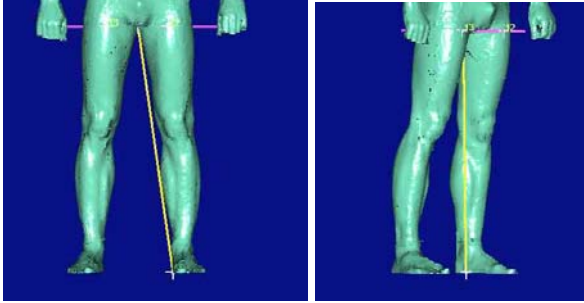
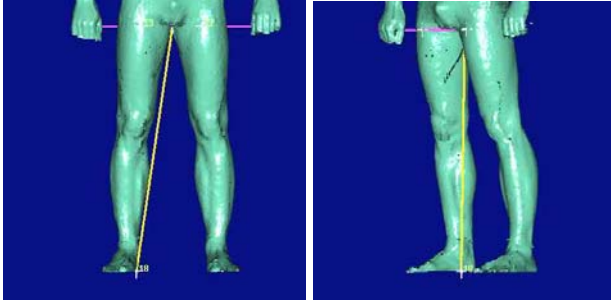
Appendix F – Body Dimensions Used For Size Selection

Name	SWX-ID	Illustration	Description
Body Height	0010		Maximum vertical height from standing surface to the top of the head. The vertical distance is measured between the standing surface and the top of the head. The subject feet are placed in footprints adhered to the standing surface.
Head Girth	1530		Maximum circumference around the top of the head. The maximum circumference of the head is measured perpendicular to its long axis of the head in a front-to-back plane with the tape passing just above the bony brow ridges and across the most protruding point of the back of the head.
Mid Neck Girth	1510		Maximum circumference around the middle of the neck. The maximum circumference of the neck is measured perpendicular to its long axis of the neck in a front-to-back plane with the tape passing through the height of the Adams apple.

Name	SWX-ID	Illustration	Description
Chest Girth (horizontal)	4510		The circumference of the chest is measured across the bust point landmarks. The circumference is measured parallel to the standing surface. The measurement is taken at the point of quiet breathing.
Chest Girth	4515		The circumference of the chest is measured across the bust point landmarks. The circumference is measured perpendicular to the axis of the torso . The measurement is taken at the point of quiet breathing.
Waist Girth	6510		The circumference of the waist is measured in the height of the natural waist. The natural waist height is determined by the height resulting in a minimum circumference. The circumference is measured parallel to the standing surface. The measurement is taken at the point of quiet breathing.
Waist Band Girth	6520		The circumference of the spatial run of the waistband is measured, and thus resulting in a better measurement for the waist width of the trouser compared to the waist circumference. The male waistband typically is lower than the waist height, since male trousers have a lower rise than female trousers.

Name	SWX-ID	Illustration	Description
			Further the run of the waistband line is not parallel to the standing surface
Bottom Girth	7520		The maximum circumference of the bottom is measured in a front-to-back plane with the tape passing just above the across the most protruding point of the buttock. The circumference is measured parallel to the standing surface.
Arm length to neck back left	8010		The distance is measured from cervicale left (7. CV), over the top of the left acromion point, then along the outside of the arm to the left wrist landmark. The subject stands with the arm slightly bended and the hand placed one hand width apart from the hip.
Arm length to neck back right	8011		The distance is measured from cervicale right (7. CV), over the top of the right acromion point, then along the outside of the arm to the right wrist landmark. The subject stands with the arm slightly bended and the hand placed one hand width apart from the hip.

Name	SWX-ID	Illustration	Description
Arm length left	8030		The distance is measured from the top of the right acromion point, then along the outside of the arm to the right wrist landmark. The subject stands with the arm slightly bended and the hand placed one hand width apart from the hip.
Arm length right	8031		The distance is measured from the top of the right acromion point, then along the outside of the arm to the right wrist landmark. The subject stands with the arm slightly bended and the hand placed one hand width apart from the hip.
Side Length left	9030		The length of a measurement band is measured from the outer side of the left foot on the standing surface to the most left point of the waistband measurement. The subject's feet are placed in footprints adhered to the standing surface
Side Length right	9031		The length of a measurement band is measured from the outer side of the right foot on the standing surface to the most right point of the waistband measurement. The subject's feet are

Name	SWX-ID	Illustration	Description
			placed in footprints adhered to the standing surface
Inseam left	9020		<p>The distance is measured from the inner side of the left foot on the standing surface to the lowest point of the crotch. The subject's feet are placed in footprints adhered to the standing surface</p>
Inseam right	9091		<p>The distance is measured from the inner side of the right foot on the standing surface to the lowest point of the crotch. The subject's feet are placed in footprints adhered to the standing surface</p>

Appendix G - Final Size Prediction Configuration

Appendix H provides the complete final size selection configuration developed during the progress of the project for the selected items issued at Ft. Carson

; US Army Fort CARSON OCIE-Items
; Date 2006, August 31
; OCIE-Items
; Tables based on Scans from Jan to July 2006

[Garments\PGC 01942 UNDERSHIRT C/W POLY-PRO]

Name=PGC 01942 UNDERSHIRT C/W POLY-PRO

Gender=m

Table=PGC 01942 UNDERSHIRT C/W POLY-PRO

Classification=0

Measure1=4515, 1.0, 1.0, 3.0999937999999996, 2.5999947999999997, 9.0999817999999998, 7.5999847999999999

Measure2=XFitVar, 17.5580162919628, 17.5580162919628, -1000000.0, 1000000.0, -1000000.0, 1000000.0, 0

Measure3=0010, 1.0, 1.0, 1.9999959999999999, 2.3999951999999998, 5.4999889999999999, 6.4999869999999999

Measure4=XFitFreq, -2.30258509299405, -2.30258509299405, -1000000.0, 1000000.0, -1000000.0, 1000000.0, 0

Measure5=7520, 6.0, 4.0, 2.6999945999999997, 1.7999963999999997, 7.7999844000000005, 5.1999895999999999

Weighting=square

[SizeTables\PGC 01942 UNDERSHIRT C/W POLY-PRO]

Col1=Size

Col2=4515

Col3=XFitVar

Col4=0010

Col5=XFitFreq

Col6=7520

Row1=S, 36.36311625, 1.0, 64.657843125, 1.0, 35.927585625

Bmin1=, 34.86705625, -1000000.0, 61.862573125, -1000000.0, 34.854753125

Bmax1=, 37.85917625, 1000000.0, 67.453113125, 1000000.0, 37.000418125

Cmin1=, 33.37099625, -1000000.0, 59.067303124999995, -1000000.0, 33.781920625

Cmax1=, 39.35523625, 1000000.0, 70.24838312499999, 1000000.0, 38.073250625

Wp1=, 0.5026370520974444, 1.5337802632905273, 0.14398093696264816, -2.77258872223978, 0.9774367857637719

Wn1=, 0.5026370520974444, 1.5337802632905273, 0.14398093696264816, -2.77258872223978, 0.9774367857637719

Row2=M, 38.27063554347827, 1.0, 67.64165405797092, 1.0, 38.34195800724636

Bmin2=, 34.517489778605714, -1000000.0, 64.29852000647405, -1000000.0, 35.347480681332556

Bmax2=, 42.02378130835078, 1000000.0, 70.98478810946818, 1000000.0, 41.33643533316005

Cmin2=, 30.7643440137332, -1000000.0, 60.95538595497718, -1000000.0, 32.35300335541872

Cmax2=, 45.77692707322337, 1000000.0, 74.32792216096504, 1000000.0, 44.33091265907413

Wp2=, 0.07986594939901431, 2.409877441213828, 0.10065722199337822, -5.62040086571715, 0.12546149679736718

Wn2=, 0.07986594939901431, 2.409877441213828, 0.10065722199337822, -5.62040086571715, 0.12546149679736718

Row3=L, 40.38432770186336, 1.0, 69.74786754658395, 1.0, 40.139793540372835

Bmin3=, 36.35233829487954, -1000000.0, 66.46908133977341, -1000000.0, 37.07230431431332

Bmax3=, 44.416317108847174, 1000000.0, 73.02665375339409, 1000000.0, 43.2072827664321

Cmin3=, 32.32034888789573, -1000000.0, 63.19029513296327, -1000000.0, 34.004815088254

Cmax3=, 48.44830651583097, 1000000.0, 76.30543996020461, 1000000.0, 46.27477199249138

Wp3=, 0.06920122104172663, 2.4861972595227275, 0.10464688940141433, -5.77455154554441, 0.11956014426159567

Wn3=, 0.06920122104172663, 2.4861972595227275, 0.10464688940141433, -5.77455154554441, 0.11956014426159567

Row4=XL, 42.9973830714284, 1.0, 71.2799474285716, 1.0, 42.123931500000005

Bmin4=, 38.82416307142856, -1000000.0, 68.20908742857159, -1000000.0, 39.4074015

Bmax4=, 47.1706030714284, 1000000.0, 74.3508074285716, 1000000.0, 44.8404615

Cmin4=, 34.65094307142856, -1000000.0, 65.1382274285716, -1000000.0, 36.6908715

Cmax4=, 51.343823071428396, 1000000.0, 77.4216674285716, 1000000.0, 47.5569915

Wp4=, 0.06459664500077518, 3.0056627623212275, 0.11929781446888704, -4.9416424226093, 0.15244862491676345

Wn4=, 0.06459664500077518, 3.0056627623212275, 0.11929781446888704, -4.9416424226093, 0.15244862491676345

Row5=XXL, 47.503841999999999, 1.0, 72.220328, 1.0, 45.267625999999999

Bmin5=, 44.098336999999994, -1000000.0, 70.4191505, -1000000.0, 42.669205999999996

Bmax5=, 50.909347, 1000000.0, 74.0215055, 1000000.0, 47.866046

Cmin5=, 40.692831999999999, -1000000.0, 68.617973, -1000000.0, 40.070786

Cmax5=, 54.314851999999995, 1000000.0, 75.822683, 1000000.0, 50.464466

Wp5= , 0.09700396314326697, 3.457005280134627, 0.34676838519093894, -2.30258509299405, 0.16662256731604888
 Wn5= , 0.09700396314326697, 3.457005280134627, 0.34676838519093894, -2.30258509299405, 0.16662256731604888

[Garments\PGC 01941 DRAWERS C/W POLY-PRO]

Name=PGC 01941 DRAWERS C/W POLY-PRO

Gender=m

Table=PGC 01941 DRAWERS C/W POLY-PRO

Classification=1

Measure1=9020, 1.0, 1.0, 1.9999959999999999, 1.9999959999999999, 3.9999919999999998, 3.9999919999999998

Measure2=6520, 3.0, 1.0, 1.9999959999999999, 1.9999959999999999, 3.9999919999999998, 3.9999919999999998

Measure3=XFitVar, 8.07558019424078, 8.07558019424078, -1000000.0, 1000000.0, -1000000.0, 1000000.0, 0

Measure4=XFitFreq, -4.90527477843843, -4.90527477843843, -1000000.0, 1000000.0, -1000000.0, 1000000.0, 0

Weighting=square

[SizeTables\PGC 01941 DRAWERS C/W POLY-PRO]

Col1=Size

Col2=9020

Col3=6520

Col4=XFitVar

Col5=XFitFreq

Row1=S, 28.070809999999999, 30.70297571428572, 1.0, 1.0

Bmin1= , 26.7716, 28.83290071428572, -1000000.0, -1000000.0

Bmax1= , 29.370019999999999, 32.57305071428572, 1000000.0, 1000000.0

Cmin1= , 25.47239, 26.96282571428572, -1000000.0, -1000000.0

Cmax1= , 30.66923, 34.44312571428572, 1000000.0, 1000000.0

Wp1= , 0.6664902692641969, 0.3216877133423642, 0.9295680216224973, -2.63905732961526

Wn1= , 0.6664902692641969, 0.3216877133423642, 0.9295680216224973, -2.63905732961526

Row2=M, 29.83960492366414, 32.14169805343513, 1.0, 1.0

Bmin2= , 27.74315242366414, 28.95136567193273, -1000000.0, -1000000.0

Bmax2= , 31.936057423664135, 35.33203043493752, 1000000.0, 1000000.0

Cmin2= , 25.646699923664137, 25.761033290430337, -1000000.0, -1000000.0

Cmax2= , 34.032509923664136, 38.52236281643992, 1000000.0, 1000000.0

Wp2= , 0.2559661101558191, 0.11053012433761969, 1.185406009355538, -5.5683445037611

Wn2= , 0.2559661101558191, 0.11053012433761969, 1.185406009355538, -5.5683445037611

Row3=L, 31.072159169139457, 34.29267189910978, 1.0, 1.0

Bmin3= , 28.604430410023383, 30.845356263875228, -1000000.0, -1000000.0

Bmax3= , 33.53988792825553, 37.739987534344365, 1000000.0, 1000000.0

Cmin3= , 26.136701650907266, 27.398040628640647, -1000000.0, -1000000.0

Cmax3= , 36.007616687371645, 41.18730316957892, 1000000.0, 1000000.0

Wp3= , 0.1847386125513142, 0.09466521470543525, 1.3299638321144478, -5.82304589548302

Wn3= , 0.1847386125513142, 0.09466521470543525, 1.3299638321144478, -5.82304589548302

Row4=XL, 31.620817481481467, 36.888523481481464, 1.0, 1.0

Bmin4= , 29.514522481481468, 33.109003481481466, -1000000.0, -1000000.0

Bmax4= , 33.72711248148147, 40.66804348148146, 1000000.0, 1000000.0

Cmin4= , 27.408227481481468, 29.329483481481468, -1000000.0, -1000000.0

Cmax4= , 35.833407481481466, 44.44756348148146, 1000000.0, 1000000.0

Wp4= , 0.2535794927866921, 0.07875519783297634, 1.606077846187798, -4.90527477843843

Wn4= , 0.2535794927866921, 0.07875519783297634, 1.606077846187798, -4.90527477843843

Row5=XXL, 31.836013636363646, 40.361408181818256, 1.0, 1.0

Bmin5= , 30.41869363636365, 37.98936568181817, -1000000.0, -1000000.0

Bmax5= , 33.253336363636365, 42.733450681818255, 1000000.0, 1000000.0

Cmin5= , 29.00137363636365, 35.61732318181817, -1000000.0, -1000000.0

Cmax5= , 34.670653636363646, 45.105493181818254, 1000000.0, 1000000.0

Wp5= , 0.5600369623678321, 0.19994363822350428, 1.7000413740478084, -2.39789527279837

Wn5= , 0.5600369623678321, 0.19994363822350428, 1.7000413740478084, -2.39789527279837

[Garments\PGC 02362 PARKA W/W (RAINSUIT)]

Name=PGC 02362 PARKA W/W (RAINSUIT)

Table=PGC 02362 PARKA W/W (RAINSUIT)

Gender=m

Classification=0

Weighting=square

Measure1=0010, 1, 1, 2.03, 2.47, 5.38, 6.55

Measure2=4515, 2.5, 1, 3.35, 2.73, 8.19, 6.69

Measure3=6510, 2.5, 1, 3.34, 2.73, 7.89, 6.45

Measure4=6520, 2.5, 1, 3.23, 2.18, 8.59, 5.8
Measure5=7520, 7, 1, 2.4, 2.13, 6.49, 5.75
Measure6=8030, 2, 1, 1.06, 1.41, 3.19, 4.23
Measure7=8031, 2, 1, 1.06, 1.41, 3.19, 4.23
Measure8=9035, 7, 1, 1.67, 1.74, 4.27, 4.45
Measure10=9036, 7, 1, 1.79, 1.66, 4.73, 4.41

[SizeTables\PGC 02362 PARKA W/W (RAINSUIT)]

Col1=Size
Col2=0010
Col3=4515
Col4=6510
Col5=6520
Col6=7520
Col7=8030
Col8=8031
Col9=9035
Col10=9036
Col11=9020

Row1=S,64.6,36.5,30.4,30.8,36.8,22.3,22.3,40.6,40.7,28.3
Row2=M,68,38.9,32.3,32.8,38.9,23.8,23.8,43.1,43.1,30.2
Row3=L,70.3,41.4,34.9,35.4,41.1,24.9,24.9,44.7,44.7,31.4
Row4=XL,71.8,43.8,37.6,37.4,42.5,25.3,25.3,46,46,32.3

[Garments\PGC 02363 TROUSER W/W (RAINSUIT)]

Name=PGC 02363 TROUSER W/W (RAINSUIT)
Table=PGC 02363 TROUSER W/W (RAINSUIT)
Gender=m
Classification=0
Weighting=square

Measure1=0010, 1, 1, 2.02, 2.46, 4.7, 5.73
Measure2=4515, 2.5, 1, 3.41, 2.68, 7.31, 5.74
Measure3=6510, 2.5, 1, 3.06, 2.6, 6.38, 5.44
Measure4=6520, 2.5, 1, 3.16, 2.24, 7.33, 5.19
Measure5=7520, 7, 1, 2.35, 2.1, 5.64, 5.04
Measure6=8030, 2, 1, 1.1, 1.41, 2.85, 3.65
Measure7=8031, 2, 1, 1.1, 1.41, 2.85, 3.65
Measure8=9035, 7, 1, 1.71, 1.69, 3.88, 3.85
Measure9=9036, 7, 1, 1.82, 1.65, 4.22, 3.82

[SizeTables\PGC 02363 TROUSER W/W (RAINSUIT)]

Col1=Size
Col2=0010
Col3=4515
Col4=6510
Col5=6520
Col6=7520
Col7=8030
Col8=8031
Col9=9035
Col10=9036

Row1=S,64.6,36.5,30.4,30.7,36.7,22.3,22.3,40.7,40.7
Row2=M,68,38.9,32.3,32.8,38.9,23.8,23.8,43.1,43.1
Row3=L,70.3,41.4,35,35.4,41.1,24.9,24.9,44.7,44.7
Row4=XL,71.8,43.8,37.5,37.3,42.4,25.3,25.4,46,46

[Garments\PGC 01917 TROUSERS C/W ECWCS]

Name=PGC 01917 TROUSERS C/W ECWCS
Table=PGC 01917 TROUSERS C/W ECWCS
Gender=m
Classification=0

Weighting=square

Measure1=0010, 0, 0, 100, 100, 100, 100
 Measure2=6520, 2.5, 1, 2.33, 2.08, 5.58, 4.97
 Measure3=6510, 2.5, 1, 2.76, 2.39, 5.94, 5.14
 Measure4=7520, 2.5, 1, 2.51, 1.54, 6.24, 3.82
 Measure5=9035, 3, 1, 1.36, 1.45, 3.07, 3.27
 Measure6=9036, 3, 1, 1.5, 1.38, 3.61, 3.32
 Measure7=9020, 3, 1, 1.39, 1.47, 3.03, 3.22
 Measure8=9021, 3, 1, 1.34, 1.44, 3.09, 3.32
 Measure10=0010, 0, 0, 100, 100, 100, 100

[SizeTables\PGC 01917 TROUSERS C/W ECWCS]

Col1=Size
 Col2=0010
 Col3=6520
 Col4=6510
 Col5=7520
 Col6=9035
 Col7=9036
 Col8=9020
 Col9=9021
 Col10=0010
 Col11=0010

Row1=S R,0,29.9,29.4,36.2,40.9,40.9,28.7,28.2,0,0
 Row2=M S,0,31,31,37,37,37,25,25,0,0
 Row3=M R,0,31,31,37,42.8,42.8,30,29.6,0,0
 Row4=M L,0,31,31,37,46,46,33,33,0,0
 Row5=L S,0,37,37,42,39,39,26,26,0,0
 Row6=L R,0,37,37,42,43.7,43.7,30.6,30.2,0,0
 Row7=L L,0,37,37,42,47,47,34,34,0,0
 Row8=XL L,0,41,41,47,48,48,35,35,0,0

[Garments\PGC 01918 PARKA C/W ECWCS]

Name=PGC 01918 PARKA C/W ECWCS
 Table=PGC 01918 PARKA C/W ECWCS
 Gender=m
 Classification=0
 Weighting=square

Measure1=0010, 2, 2, 2, 2, 4, 4
 Measure2=4515, 2.5, 1, 3, 3, 6, 6
 Measure3=6510, 0, 0, 100, 100, 100, 100
 Measure4=6520, 0, 0, 100, 100, 100, 100
 Measure5=7520, 0, 0, 100, 100, 100, 100
 Measure6=8030, 0, 0, 100, 100, 100, 100
 Measure7=8031, 0, 0, 100, 100, 100, 100
 Measure8=9035, 0, 0, 100, 100, 100, 100
 Measure10=9036, 0, 0, 100, 100, 100, 100

[SizeTables\PGC 01918 PARKA C/W ECWCS]

Col1=Size
 Col2=0010
 Col3=4515
 Col4=6510
 Col5=6520
 Col6=7520
 Col7=8030
 Col8=8031
 Col9=9035
 Col10=9036
 Col11=9020

Row1=M R,68.8,38.3,0,0,0,0,0,0,0,0

Row2=M L,72.8,38.3,0,0,0,0,0,0,0
Row3=L R,68.8,42.3,0,0,0,0,0,0,0
Row4=L L,72.8,42.3,0,0,0,0,0,0,0
Row5=XL R,68.8,46.3,0,0,0,0,0,0,0
Row6=XL L,72.8,46.3,0,0,0,0,0,0,0

[Garments\PGC 02637 PARKA ECWCS DSRT]

Name=PGC 02637 PARKA ECWCS DSRT
Table=PGC 02637 PARKA ECWCS DSRT
Gender=m
Classification=0
Weighting=square

Measure1=0010, 2, 2, 1.82, 2.2, 4, 4.85
Measure2=4515, 2.5, 1, 3.97, 3.77, 8.4, 7.98
Measure3=6510, 0, 0, 100, 100, 100, 100
Measure4=6520, 0, 0, 100, 100, 100, 100
Measure5=7520, 0, 0, 100, 100, 100, 100
Measure6=8030, 0, 0, 100, 100, 100, 100
Measure7=8031, 0, 0, 100, 100, 100, 100
Measure8=9035, 0, 0, 100, 100, 100, 100
Measure10=9036, 0, 0, 100, 100, 100, 100

[SizeTables\PGC 02637 PARKA ECWCS DSRT]

Col1=Size
Col2=0010
Col3=4515
Col4=6510
Col5=6520
Col6=7520
Col7=8030
Col8=8031
Col9=9035
Col10=9036
Col11=9020

Row1=S R,69.3,35.3,0,0,0,0,0,0,0
Row2=M R,69.3,39.3,0,0,0,0,0,0,0
Row3=L R,69.3,43.3,0,0,0,0,0,0,29.2
Row4=L L,73.3,43.3,0,0,0,0,0,0,30.7
Row5=XL R,69.3,47.3,0,0,0,0,0,0,0
Row6=XL L,73.3,47.3,0,0,0,0,0,0,32.2

[Garments\PGC 02151 TROUSERS DCU]

Name=PGC 02151 TROUSERS DCU
Table=PGC 02151 TROUSERS DCU
Gender=m
Classification=0
Weighting=square

Measure1=0010, 0, 0, 100, 100, 100, 100
Measure2=6520, 2.5, 1, 2.68, 1.98, 6.1, 4.51
Measure3=6510, 2.5, 1, 3.36, 2.64, 6.61, 5.2
Measure4=7520, 2.5, 1, 2.51, 1.61, 5.4, 3.46
Measure5=9035, 4, 4, 1.68, 1.46, 3.74, 3.24
Measure6=9036, 4, 4, 1.7, 1.45, 3.9, 3.32
Measure7=9020, 4, 4, 1.66, 1.43, 3.7, 3.19
Measure8=9021, 4, 4, 1.65, 1.42, 3.77, 3.24
Measure10=0010, 0, 0, 100, 100, 100, 100

[SizeTables\PGC 02151 TROUSERS DCU]

Col1=Size
Col2=0010
Col3=6520

Col4=6510
Col5=7520
Col6=9035
Col7=9036
Col8=9020
Col9=9021
Col10=0010
Col11=0010

Row1=S R,0,30,30,36,41.5,41.5,28.8,28.4,0,0
Row2=S L,0,30,30,36,43.7,43.7,31.1,30.7,0,0
Row3=M S,0,33,33,39,41.2,41.2,28.7,28.2,0,0
Row4=M R,0,33,33,39,43.1,43.1,30.2,29.8,0,0
Row5=M L,0,33,33,39,45.3,45.3,32.1,31.7,0,0
Row6=L R,0,40,40,46,43.9,43.9,30.5,30.1,0,0
Row7=L L,0,40,40,46,45.4,45.4,32,32,0,0
Row8=XL R,0,48,48,53,44.4,44.4,30.6,30.2,0,0
Row9=XL L,0,48,48,53,48,48,32.9,32.4,0,0

[Garments\PGC 02671 TROUSERS ECWCS DSRT]

Name=PGC 02671 TROUSERS ECWCS DSRT
Table=PGC 02671 TROUSERS ECWCS DSRT
Gender=m
Classification=0
Weighting=square

Measure1=0010, 0, 0, 100, 100, 100, 100
Measure2=6520, 2.5, 1, 3.26, 2.22, 6.56, 4.46
Measure3=6510, 2.5, 1, 3.87, 2.78, 7.1, 5.09
Measure4=7520, 2.5, 1, 2.47, 1.91, 5.24, 4.06
Measure5=9035, 2, 1, 1.48, 1.33, 3.04, 2.73
Measure6=9036, 2, 1, 1.49, 1.35, 3.05, 2.78
Measure7=9020, 2, 1, 1.45, 1.48, 2.79, 2.84
Measure8=9021, 2, 1, 1.45, 1.49, 2.82, 2.9
Measure10=0010, 0, 0, 100, 100, 100, 100

[SizeTables\PGC 02671 TROUSERS ECWCS DSRT]

Col1=Size
Col2=0010
Col3=6520
Col4=6510
Col5=7520
Col6=9035
Col7=9036
Col8=9020
Col9=9021
Col10=0010
Col11=0010

Row1=XS XS,0,23,24,33,37,37,25,25,0,0
Row2=S R,0,28,27.5,35,41,41,29,29,0,0
Row3=S L,0,28,27.5,35,44,44,33,33,0,0
Row4=M S,0,33,33,38,40,40,27,27,0,0
Row5=M R,0,33,33,38,43,43,30,30,0,0
Row6=L R,0,39,39,44,43,43,30,30,0,0
Row7=L L,0,39,39,44,48,48,33,33,0,0
Row8=XL R,0,45,45,50,43,43,30,30,0,0
Row9=XL L,0,45,45,50,48,48,34,34,0,0

[Garments\PGC 00399 TROUSER W/W]

Name=PGC 00399 TROUSER W/W
Table=PGC 00399 TROUSER W/W
Gender=m
Classification=0

Weighting=square

Measure1=0010, 1, 1, 20, 20, 40, 40

[SizeTables\PGC 00399 TROUSER W/W]

Col1=Size

Col2=0010

Row1=M,60

[Garments\PGC 01736 TROUSERS C/W WDLD CAMO]

Name=PGC 01736 TROUSERS C/W WDLD CAMO

Table=PGC 01736 TROUSERS C/W WDLD CAMO

Gender=m

Classification=0

Weighting=square

Measure1=0010, 0, 0, 20, 20, 40, 40

[SizeTables\PGC 01736 TROUSERS C/W WDLD CAMO]

Col1=Size

Col2=0010

Row1=M R,60

[Garments\PGC 02665 SHIRT C/W BLK FLEECE]

Name=PGC 02665 SHIRT C/W BLK FLEECE

Gender=m

Table=PGC 02665 SHIRT C/W BLK FLEECE

Classification=0

Measure1=XFitVar, 7.7, 7.7, -999995.46, 999995.46, -999995.46, 999995.46, 0

Measure2=XFitFreq, -5.6, -5.6, -999995.46, 999995.46, -999995.46, 999995.46, 0

Measure3=7520, 4.0, 2.0, 2.999994, 2.999994, 5.999988, 5.999988

Measure4=0010, 1.0, 1.0, 2.999994, 2.999994, 5.999988, 5.999988

Weighting=square

[SizeTables\PGC 02665 SHIRT C/W BLK FLEECE]

Col1=Size

Col2=XFitVar

Col3=XFitFreq

Col4=7520

Col5=0010

Row1=S, 1.0, 1.0, 38.9692134, 67.73923459999999

Bmin1=, -1000000.0, -1000000.0, 35.3963859, 64.7372721

Bmax1=, 1000000.0, 1000000.0, 42.542040899999996, 70.7411971

Cmin1=, -1000000.0, -1000000.0, 31.8235584, 61.735309599999994

Cmax1=, 1000000.0, 1000000.0, 46.114868399999999, 73.743159599999998

Wp1=, 2.273206091003667, -3.91202300542815, 0.08813094469609199, 0.12483661866873803

Wn1=, 2.273206091003667, -3.91202300542815, 0.08813094469609199, 0.12483661866873803

Row2=M, 1.0, 1.0, 38.58336298449611, 67.92829876447878

Bmin2=, -1000000.0, -1000000.0, 35.53256405371051, 64.77869876447878

Bmax2=, 1000000.0, 1000000.0, 41.63416191528168, 71.07789876447879

Cmin2=, -1000000.0, -1000000.0, 32.481765122924905, 61.62909876447879

Cmax2=, 1000000.0, 1000000.0, 44.684960846067284, 74.22749876447878

Wp2=, 1.516291816203018, -5.55682806169954, 0.12087190070678146, 0.11340748487948593

Wn2=, 1.516291816203018, -5.55682806169954, 0.12087190070678146, 0.11340748487948593

Row3=L, 1.0, 1.0, 40.590469999999996, 69.66249982758626

Bmin3=, -1000000.0, -1000000.0, 37.63772, 66.11224147230693

Bmax3=, 1000000.0, 1000000.0, 43.54322, 73.21275818286557

Cmin3=, -1000000.0, -1000000.0, 34.68497, 62.56198311702801

Cmax3=, 1000000.0, 1000000.0, 46.49597, 76.76301653814453

Wp3=, 1.6159310107936484, -5.85220247977447, 0.12903251612954844, 0.08925501063834905

Wn3=, 1.6159310107936484, -5.85220247977447, 0.12903251612954844, 0.08925501063834905

Row4=XL, 1.0, 1.0, 43.017988409090876, 71.61995030075188

Bmin4= , -1000000.0, -1000000.0, 39.445160909090866, 68.84436530075189
 Bmax4= , 1000000.0, 1000000.0, 46.59081590909088, 74.39553530075189
 Cmin4= , -1000000.0, -1000000.0, 35.872333409090906, 66.06878030075188
 Cmax4= , 1000000.0, 1000000.0, 50.163643409090874, 77.1711203007519
 Wp4= , 1.803818446479287, -4.89034912822175, 0.08813094469609199, 0.1460304618940116
 Wn4= , 1.803818446479287, -4.89034912822175, 0.08813094469609199, 0.1460304618940116

[Garments\PGC 02146 COAT C/W DCU]

Name=PGC 02146 COAT C/W DCU
 Table=PGC 02146 COAT C/W DCU
 Gender=m
 Classification=0
 Weighting=square

Measure1=0010, 2, 2, 20, 20, 40, 40

[SizeTables\PGC 02146 COAT C/W DCU]

Col1=Size
 Col2=0010

Row1=M R,60

[Garments\PGC 02164 COAT CAMO ABDU DSRT]

Name=PGC 02164 COAT CAMO ABDU DSRT
 Table=PGC 02164 COAT CAMO ABDU DSRT
 Gender=m
 Classification=0
 Weighting=square

Measure1=0010, 2, 2, 20, 20, 40, 40

[SizeTables\PGC 02164 COAT CAMO ABDU DSRT]

Col1=Size
 Col2=0010

Row1=M R,60

[Garments\PGC 02666 OVERALLS FLEECE BLK]

Name=PGC 02666 OVERALLS FLEECE BLK
 Gender=m
 Table=PGC 02666 OVERALLS FLEECE BLK
 Classification=0
 Measure1=4515, 1.0, 1.0, 2.999994, 2.999994, 5.999988, 5.999988
 Measure2=9036, 1.0, 1.0, 2.999994, 2.999994, 5.999988, 5.999988
 Measure3=XFitVar, 12.4072242865166, 12.4072242865166, -1000000.0, 1000000.0, -1000000.0, 1000000.0, 0
 Measure4=XFitFreq, -3.66356164612965, -3.66356164612965, -1000000.0, 1000000.0, -1000000.0, 1000000.0, 0
 Weighting=square

[SizeTables\PGC 02666 OVERALLS FLEECE BLK]

Col1=Size
 Col2=4515
 Col3=9036
 Col4=XFitVar
 Col5=XFitFreq
 Row1=S SR, 40.85404881355943, 44.15912694915253, 1.0, 1.0
 Bmin1= , 36.25760131355931, 41.265431949152536, -1000000.0, -1000000.0
 Bmax1= , 45.45049631355943, 47.05282194915254, 1000000.0, 1000000.0
 Cmin1= , 31.66115381355931, 38.371736949152535, -1000000.0, -1000000.0
 Cmax1= , 50.04694381355942, 49.94651694915253, 1000000.0, 1000000.0
 Wp1= , 0.05324856573077671, 0.13435289059719738, 2.419401542831407, -4.07753744390572
 Wn1= , 0.05324856573077671, 0.13435289059719738, 2.419401542831407, -4.07753744390572
 Row2=M SR, 38.820351906614796, 42.849938906249996, 1.0, 1.0
 Bmin2= , 35.0703594066148, 40.723958906250004, -1000000.0, -1000000.0

Bmax2= , 42.57034440661492, 44.975918906249994, 1000000.0, 1000000.0
Cmin2= , 31.320366906614797, 38.59797890625, -1000000.0, -1000000.0
Cmax2= , 46.320336906614926, 47.10189890625, 1000000.0, 1000000.0
Wp2= , 0.08000032000096004, 0.24890531660792492, 1.4851834197171678, -5.55295958492162
Wn2= , 0.08000032000096004, 0.24890531660792492, 1.4851834197171678, -5.55295958492162
Row3=M L, 38.60178025641024, 44.04897307692293, 1.0, 1.0
Bmin3= , 35.38328275641024, 42.05094557692292, -1000000.0, -1000000.0
Bmax3= , 41.82027775641027, 46.04700057692292, 1000000.0, 1000000.0
Cmin3= , 32.164785256410234, 40.05291807692292, -1000000.0, -1000000.0
Cmax3= , 45.03877525641027, 48.04502807692292, 1000000.0, 1000000.0
Wp3= , 0.10860408730708561, 0.2818055874119575, 1.7322404451822777, -3.66356164612965
Wn3= , 0.10860408730708561, 0.2818055874119575, 1.7322404451822777, -3.66356164612965
Row4=L SR, 41.634526335878036, 43.97674252873549, 1.0, 1.0
Bmin4= , 37.58925883587788, 41.46079609683252, -1000000.0, -1000000.0
Bmax4= , 45.67979383587803, 46.49268896063886, 1000000.0, 1000000.0
Cmin4= , 33.54399133587788, 38.9448496649293, -1000000.0, -1000000.0
Cmax4= , 49.72506133587804, 49.00863539254184, 1000000.0, 1000000.0
Wp4= , 0.06874767762243526, 0.17772549897303283, 1.6529885911579676, -5.5683445037611
Wn4= , 0.06874767762243526, 0.17772549897303283, 1.6529885911579676, -5.5683445037611
Row5=L L, 41.00835442857159, 45.117457571428396, 1.0, 1.0
Bmin5= , 36.584797677375626, 43.1194300714284, -1000000.0, -1000000.0
Bmax5= , 45.43191117976717, 47.1154850714284, 1000000.0, 1000000.0
Cmin5= , 32.16124092617986, 41.1214025714284, -1000000.0, -1000000.0
Cmax5= , 49.855467930963144, 49.113512571428394, 1000000.0, 1000000.0
Wp5= , 0.05749225137141773, 0.2818055874119575, 1.6702287025883873, -4.26267987704132
Wn5= , 0.05749225137141773, 0.2818055874119575, 1.6702287025883873, -4.26267987704132
Row6=XL SR, 43.07078, 44.97604939393941, 1.0, 1.0
Bmin6= , 38.5924425, 42.820541893939414, -1000000.0, -1000000.0
Bmax6= , 47.5491175, 47.13155689393942, 1000000.0, 1000000.0
Cmin6= , 34.114105, 40.665034393939415, -1000000.0, -1000000.0
Cmax6= , 52.027455, 49.28706439393941, 1000000.0, 1000000.0
Wp6= , 0.05609431929312577, 0.24213270056211025, 1.9482746477161381, -3.49650756146648
Wn6= , 0.05609431929312577, 0.24213270056211025, 1.9482746477161381, -3.49650756146648
Row7=XL L, 43.5010378571428, 46.19132119047601, 1.0, 1.0
Bmin7= , 39.495140357142795, 44.17360869047601, -1000000.0, -1000000.0
Bmax7= , 47.506935357142794, 48.209033690476, 1000000.0, 1000000.0
Cmin7= , 35.48924285714284, 42.15589619047601, -1000000.0, -1000000.0
Cmax7= , 51.5128328571428, 50.226746190476, 1000000.0, 1000000.0
Wp7= , 0.07010562364795055, 0.2763337644654219, 1.8238322061824572, -3.73766961828337
Wn7= , 0.07010562364795055, 0.2763337644654219, 1.8238322061824572, -3.73766961828337

; US Army Fort CARSON OCIE-Items - Additional Items
; OCIE-Items

[GarmentsPGC 00356 LINER, COLD WEATHER TROUSERS]

Name=PGC 00356 LINER, COLD WEATHER TROUSERS

Table=PGC 00356 LINER, COLD WEATHER TROUSERS

Gender=m

Classification=0

Weighting=square

Measure1=0010, 0, 0, 1.67, 1.88, 4.24, 4.77

Measure2=6520, 2.5, 1, 2.42, 1.95, 6.45, 5.2

Measure3=6510, 2.5, 1, 2.88, 2.16, 7.09, 5.3

Measure4=7520, 2.5, 1, 2.13, 1.6, 5.52, 4.15

Measure5=9035, 7, 1, 1.28, 1.46, 3.29, 3.75

Measure6=9036, 7, 1, 1.37, 1.44, 3.57, 3.76

Measure7=9020, 7, 1, 1.33, 1.5, 3.43, 3.87

Measure8=9021, 7, 1, 1.33, 1.51, 3.5, 3.98

Measure10=0010, 0, 0, 1.67, 1.88, 4.24, 4.77

[SizeTablesPGC 00356 LINER, COLD WEATHER TROUSERS]

Col1=Size

Col2=0010

Col3=6520

Col4=6510

Col5=7520
Col6=9035
Col7=9036
Col8=9020
Col9=9021
Col10=0010
Col11=0010

Row1=XS SR,0,25,24.5,31,38.5,38.5,28,27.5,0,0
Row2=XS SR,0,25,24.5,31,41,41,30,29.5,0,0
Row3=XS L,0,25,24.5,31,43.5,43.5,32,31.5,0,0
Row4=S SR,0,28.5,28,34.5,39,39,28.1,27.6,0,0
Row5=S SR,64.9,29.6,29.2,35.8,40.9,41,28.7,28.3,64.9,64.9
Row6=S L,0,28.5,28,34.5,44,44,32.1,31.6,0,0
Row7=M SR,0,32.5,32,38.5,39.5,39.5,28.3,27.8,0,0
Row8=M SR,67.7,32.6,32.1,38.6,42.8,42.9,30.1,29.6,67.7,67.7
Row9=M L,70.9,32.6,31.5,38.6,45.3,45.3,32,31.6,70.9,70.9
Row10=L SR,66,34.5,34.6,40.1,41.4,41.5,28.6,28.2,66,66
Row11=L SR,69.1,35,34.7,40.7,43.7,43.8,30.7,30.2,69.1,69.1
Row12=L L,72,34.7,33.9,40.7,46.1,46.1,32.6,32.2,72,72
Row13=XL SR,0,40.5,40,46.5,43,43,30.5,30,0,0
Row14=XL L,0,40.5,40,46.5,45.5,45.5,32.5,32,0,0

[Garments\PGC 00352 LINER, COLD WEATHER COAT]

Name=PGC 00352 LINER, COLD WEATHER COAT

Gender=m

Table=PGC 00352 LINER, COLD WEATHER COAT

Classification=0

Measure1=4515, 2.5, 1.0, 3.05999388, 2.35999528, 7.2999854, 5.62998874
Measure2=7520, 7.0, 1.0, 2.27999544, 1.7699964599999998, 5.6799886399999999, 4.41999116
Measure3=9035, 7.0, 1.0, 1.3899972199999997, 1.42999714, 3.66999266, 3.7799924399999996
Measure4=XFitVar, 36.9238360817158, 36.9238360817158, -1000000.0, 1000000.0, -1000000.0, 1000000.0, 0
Measure5=0010, 2.0, 2.0, 1.7899964199999998, 1.90999618, 4.46999106, 4.75999048
Measure6=6520, 2.5, 1.0, 2.6499947, 2.06999586, 7.0999858, 5.53998892
Measure7=8031, 2.0, 1.0, 0.97999804, 1.18999762, 2.5799948399999995, 3.13999372
Measure8=XFitFreq, -1.79175946922806, -1.79175946922806, -1000000.0, 1000000.0, -1000000.0, 1000000.0, 0
Measure9=6510, 2.5, 1.0, 3.1099937799999995, 2.30999538, 7.5399849199999999, 5.60998878
Measure10=8030, 2.0, 1.0, 0.97999804, 1.18999762, 2.5799948399999995, 3.13999372
Measure11=9036, 7.0, 1.0, 1.47999704, 1.40999718, 3.9699920599999996, 3.8099923799999997
Weighting=square

[SizeTables\PGC 00352 LINER, COLD WEATHER COAT]

Col1=Size

Col2=4515

Col3=7520

Col4=9035

Col5=XFitVar

Col6=0010

Col7=6520

Col8=8031

Col9=XFitFreq

Col10=6510

Col11=8030

Col12=9036

Row1=S, 35.334574999999994, 35.56423333333332, 39.95398833333332, 1.0, 64.035305, 30.44613333333332,
22.860846666666678, 1.0, 30.22959833333332, 22.55901, 39.95398833333332
Bmin1=, 33.9664675, 34.79651833333332, 38.75320333333332, -1000000.0, 62.007749999999994, 29.47172583333332,
21.984864166666668, -1000000.0, 28.979600833333322, 21.436964999999997, 38.75320333333332
Bmax1=, 36.7026825, 36.33194833333332, 41.15477333333332, 1000000.0, 66.062859999999999, 31.42054083333332,
23.736829166666677, 1000000.0, 31.47959583333332, 23.681055, 41.15477333333332
Cmin1=, 32.59836, 34.02880333333332, 37.55241833333332, -1000000.0, 59.980195, 28.497318333333318,
21.108881666666668, -1000000.0, 27.72960333333332, 20.31492, 37.55241833333332
Cmax1=, 38.070789999999995, 37.09966333333332, 42.35555833333332, 1000000.0, 68.090415, 32.394948333333325,
24.612811666666676, 1000000.0, 32.72959333333332, 24.803099999999997, 42.35555833333332

Wp1= , 0.6010520393178073, 1.9087650315021927, 0.780228866679611, 4.325919179319982, 0.27365742416013167, 1.1848715898030187, 1.4660934795681533, -1.79175946922806, 0.7200028800086377, 0.8935769815065698, 0.780228866679611
Wn1= , 0.6010520393178073, 1.9087650315021927, 0.780228866679611, 4.325919179319982, 0.27365742416013167, 1.1848715898030187, 1.4660934795681533, -1.79175946922806, 0.7200028800086377, 0.8935769815065698, 0.780228866679611
Row2=M, 38.67520267605632, 38.631396619718295, 43.17391830985919, 1.0, 68.1111936111112, 32.90333887323941, 24.56798901408449, 1.0, 32.09320408450704, 24.270773239436636, 43.250440281690125
Bmin2= , 35.230327676056326, 36.5349441197183, 41.32352830985919, -1000000.0, 65.75883611111121, 30.324603873239415, 23.29830651408449, -1000000.0, 29.39635908450704, 23.099515739436633, 41.35083778169013
Bmax2= , 42.12007767605648, 40.72784911971837, 45.02430830985919, 1000000.0, 70.463551111112, 35.482073873239415, 25.837671514084487, 1000000.0, 34.79004908450704, 25.442030739436632, 45.15004278169013
Cmin2= , 31.785452676056323, 34.4384916197183, 39.47313830985919, -1000000.0, 63.406478611111204, 27.745868873239417, 22.02862401408449, -1000000.0, 26.69951408450704, 21.928258239436637, 39.45123528169014
Cmax2= , 45.56495267605648, 42.82430161971837, 46.874698309859184, 1000000.0, 72.8159086111112, 38.06080887323942, 27.10735401408449, 1000000.0, 37.48689408450704, 26.613288239436635, 47.049645281690125
Wp2= , 0.09479939960538247, 0.2559661101558191, 0.32856853926152574, 5.015915055826682, 0.2033039766751173, 0.16917613267961315, 0.6978502765254114, -4.27666611901606, 0.15468227465047904, 0.8200640104271824, 0.3117647843340591
Wn2= , 0.09479939960538247, 0.2559661101558191, 0.32856853926152574, 5.015915055826682, 0.2033039766751173, 0.16917613267961315, 0.6978502765254114, -4.27666611901606, 0.15468227465047904, 0.8200640104271824, 0.3117647843340591
Row3=L, 42.186842602739745, 41.49651931506861, 44.40666342465772, 1.0, 70.20965356164392, 35.951821095890416, 25.42762684931506, 1.0, 35.609895342465734, 25.139632602739706, 44.46005561643849
Bmin3= , 38.01362260273971, 39.29179931506849, 42.083833424657726, -1000000.0, 66.96162856164392, 32.50694609589041, 23.695346849315058, -1000000.0, 31.840217842465734, 23.308927602739708, 42.11754061643848
Bmax3= , 46.360062602739745, 43.70123931506861, 46.729493424657726, 1000000.0, 73.45767856164393, 39.39669609589038, 27.15990684931506, 1000000.0, 39.37957284246569, 26.970337602739704, 46.80257061643848
Cmin3= , 33.8404026027397, 37.08707931506849, 39.76100342465772, -1000000.0, 63.71360356164392, 29.062071095890413, 21.963066849315062, -1000000.0, 28.070540342465733, 21.478222602739706, 39.775025616438484
Cmax3= , 50.53328260273974, 45.90595931506861, 49.05232342465772, 1000000.0, 76.70570356164393, 42.84157109589038, 28.89218684931506, 1000000.0, 43.14925034246569, 28.801042602739702, 49.145085616438486
Wp3= , 0.06459664500077518, 0.2314438466928283, 0.20850557403869846, 6.6560483614341805, 0.10663844308227137, 0.09479939960538247, 0.3749007764611105, -4.29045944114839, 0.07916698901525936, 0.3356725185472127, 0.20501600260679625
Wn3= , 0.06459664500077518, 0.2314438466928283, 0.20850557403869846, 6.6560483614341805, 0.10663844308227137, 0.09479939960538247, 0.3749007764611105, -4.29045944114839, 0.07916698901525936, 0.3356725185472127, 0.20501600260679625
Row4=XL, 45.6692, 44.210541500000005, 44.7814065, 1.0, 70.606158, 38.4861435, 25.677114000000003, 1.0, 38.614095999999996, 25.314909999999998, 44.850303999999994
Bmin4= , 43.366054999999996, 41.759758999999995, 43.177079, -1000000.0, 68.8837205, 36.005833499999994, 24.181054000000003, -1000000.0, 36.488116, 23.818849999999998, 43.226291499999995
Bmax4= , 47.972345, 46.661324, 46.385734, 1000000.0, 72.32859549999999, 40.9664535, 27.173174, 1000000.0, 40.740075999999995, 26.81097, 46.4743165
Cmin4= , 41.062909999999995, 39.3089765, 41.5727515, -1000000.0, 67.161283, 33.52552349999999, 22.684994, -1000000.0, 34.362136, 22.32279, 41.602278999999996
Cmax4= , 50.275490000000005, 49.1121065, 47.990061499999996, 1000000.0, 74.051033, 43.446763499999996, 28.669234, 1000000.0, 42.86605599999999, 28.307029999999997, 48.098329
Wp4= , 0.21208500350024384, 0.1873022443454036, 0.43708556782940094, 5.924830975843477, 0.3791975984215299, 0.18286921220174124, 0.5026370520974444, -2.99573227355399, 0.24890531660792492, 0.5026370520974444, 0.4265537723290855
Wn4= , 0.21208500350024384, 0.1873022443454036, 0.43708556782940094, 5.924830975843477, 0.3791975984215299, 0.18286921220174124, 0.5026370520974444, -2.99573227355399, 0.24890531660792492, 0.5026370520974444, 0.4265537723290855

[Garments\PGC 01755 BODY ARMOR, FRAGMENTATION PROTECT]

Name=PGC 01755 BODY ARMOR, FRAGMENTATION PROTECT

Gender=m

Table=PGC 01755 BODY ARMOR, FRAGMENTATION PROTECT

Classification=0

Measure1=XFitFreq, -2.19722457733622, -2.19722457733622, -1000000.0, 1000000.0, -1000000.0, 1000000.0, 0

Measure2=4515, 2.5, 1.0, 3.05999388, 2.35999528, 7.2999854, 5.62998874

Measure3=0010, 2.0, 2.0, 1.7899964199999998, 1.90999618, 4.46999106, 4.75999048

Measure4=XFitVar, 8.28762547592683, 8.28762547592683, -1000000.0, 1000000.0, -1000000.0, 1000000.0, 0

Weighting=square

[SizeTables\PGC 01755 BODY ARMOR, FRAGMENTATION PROTECT]

Col1=Size

Col2=XFitFreq

Col3=4515

Col4=0010

Col5=XFitVar

Row1=M R, 1.0, 38.791882631578936, 67.97644921052613, 1.0

Bmin1=, -1000000.0, 35.71118013157894, 66.07684671052613, -1000000.0

Bmax1=, 1000000.0, 41.87258513157878, 69.87605171052613, 1000000.0

Cmin1=, -1000000.0, 32.63047763157894, 64.17724421052613, -1000000.0

Cmax1=, 1000000.0, 44.95328763157878, 71.77565421052613, 1000000.0

Wp1=, -3.63758615972639, 0.1185367458242846, 0.3117647843340591, 1.659568359814168

Wn1=, -3.63758615972639, 0.1185367458242846, 0.3117647843340591, 1.659568359814168

Row2=M L, 1.0, 36.747958, 68.70458699999999, 1.0

Bmin2=, -1000000.0, 35.153473, 66.106167, -1000000.0

Bmax2=, 1000000.0, 38.34244299999999, 71.303007, 1000000.0

Cmin2=, -1000000.0, 33.558988, 63.50774699999999, -1000000.0

Cmax2=, 1000000.0, 39.93692799999999, 73.901427, 1000000.0

Wp2=, -2.30258509299405, 0.44249834063631177, 0.16662256731604888, 1.5841660114565173

Wn2=, -2.30258509299405, 0.44249834063631177, 0.16662256731604888, 1.5841660114565173

Row3=L R, 1.0, 40.578659, 68.44868199999999, 1.0

Bmin3=, -1000000.0, 38.4231515, 66.29317449999999, -1000000.0

Bmax3=, 1000000.0, 42.7341665, 70.60418949999999, 1000000.0

Cmin3=, -1000000.0, 36.267644, 64.137667, -1000000.0

Cmax3=, 1000000.0, 44.889674, 72.75969699999999, 1000000.0

Wp3=, -2.30258509299405, 0.24213270056211025, 0.24213270056211025, 1.8239670389981484

Wn3=, -2.30258509299405, 0.24213270056211025, 0.24213270056211025, 1.8239670389981484

Row4=L L, 1.0, 41.3516233333332, 71.1984577777776, 1.0

Bmin4=, -1000000.0, 39.324068333333315, 69.0527927777776, -1000000.0

Bmax4=, 1000000.0, 43.3791783333332, 73.3441227777776, 1000000.0

Cmin4=, -1000000.0, 37.296513333333316, 66.9071277777776, -1000000.0

Cmax4=, 1000000.0, 45.4067333333332, 75.48978777777761, 1000000.0

Wp4=, -2.19722457733622, 0.27365742416013167, 0.24435919644094264, 1.8181231278738483

Wn4=, -2.19722457733622, 0.27365742416013167, 0.24435919644094264, 1.8181231278738483

Row5=XL L, 1.0, 43.47010428571439, 73.4419228571428, 1.0

Bmin5=, -1000000.0, 40.271291785714396, 71.8671228571428, -1000000.0

Bmax5=, 1000000.0, 46.668916785714394, 75.0167228571428, 1000000.0

Cmin5=, -1000000.0, 37.07247928571428, 70.29232285714279, -1000000.0

Cmax5=, 1000000.0, 49.8677292857144, 76.59152285714279, 1000000.0

Wp5=, -1.94591014905531, 0.1099448658145265, 0.4536299395179437, 2.207104153596207

Wn5=, -1.94591014905531, 0.1099448658145265, 0.4536299395179437, 2.207104153596207

[Garments\PGC 01772 OVERALLS, COMBAT VEHICLE CREWMEN]

Name=PGC 01772 OVERALLS, COMBAT VEHICLE CREWMEN

Table=PGC 01772 OVERALLS, COMBAT VEHICLE CREWMEN

Gender=m

Classification=0

Weighting=square

Measure1=0010, 2, 2, 1.79, 1.91, 4.47, 4.76

Measure2=4515, 2.5, 1, 3.06, 2.36, 7.3, 5.63

Measure3=6510, 2.5, 1, 3.11, 2.31, 7.54, 5.61

Measure4=6520, 2.5, 1, 2.65, 2.07, 7.1, 5.54

Measure5=7520, 7, 1, 2.28, 1.77, 5.68, 4.42

Measure6=8030, 2, 1, 0.98, 1.19, 2.58, 3.14

Measure7=8031, 2, 1, 0.98, 1.19, 2.58, 3.14

Measure8=9035, 7, 1, 1.39, 1.43, 3.67, 3.78

Measure10=9036, 7, 1, 1.48, 1.41, 3.97, 3.81

[SizeTables\PGC 01772 OVERALLS, COMBAT VEHICLE CREWMEN]

Col1=Size

Col2=0010

Col3=4515

Col4=6510

Col5=6520
Col6=7520
Col7=8030
Col8=8031
Col9=9035
Col10=9036
Col11=9020

Row1=XS S,65,31,24.5,25,31,0,0,38.5,38.5,28
Row2=XS R,69,31,24.5,25,31,0,0,41,41,30
Row3=XS L,73,31,24.5,25,31,0,0,43.5,43.5,32

Row4=S S,65,35,28,28.5,34.5,0,0,39,39,28.1
Row5=S R,64.5,35.5,29.2,29.7,35.8,22.3,22.3,40.7,40.7,28.4
Row6=S L,73,35,28,28.5,34.5,0,0,44,44,32.1

Row7=M S,65,39,32,32.5,38.5,0,0,39.5,39.5,28.3
Row8=M R,67.7,38.5,32,32.5,38.5,23.6,23.6,42.8,42.9,30.1
Row9=M L,70.8,38,31.6,32.6,38.5,24.9,24.9,45.2,45.3,32

Row10=L S,65,43,36,36.5,42.5,0,0,40,40,28.4
Row11=L R,69.1,41.2,34.6,35,40.7,24.3,24.3,43.7,43.8,30.6
Row12=L L,71.8,40.2,33.8,34.6,40.6,25.6,25.6,45.9,46,32.5

Row13=XL S,0,0,-1,-0.5,5.5,0,0,1,1,0
Row14=XL R,70.2,45,38.4,38.2,43,24.9,24.9,44.6,44.7,31
Row15=XL L,73,47,40,40.5,46.5,0,0,45.5,45.5,32.5

[Garments\PGC 01812 BODY ARMOR, FRAGMENTATION PROTECT]

Name=PGC 01812 BODY ARMOR, FRAGMENTATION PROTECT
Table=PGC 01812 BODY ARMOR, FRAGMENTATION PROTECT
Gender=m
Classification=0
Weighting=square

Measure1=0010, 0, 0, 100, 100, 100, 100
Measure2=4515, 3, 1, 2, 2, 4, 4

[SizeTables\PGC 01812 BODY ARMOR, FRAGMENTATION PROTECT]

Col1=Size
Col2=0010
Col3=4515

Row1=XS,0,31
Row2=S,0,35
Row3=M,0,39
Row4=L,0,43
Row5=XL,0,47
Row6=XXL,0,51
Row7=XXXL,0,55
Row8=XXXXL,0,59

[Garments\PGC 01928 OVERALLS, COLD WEATHER]

Name=PGC 01928 OVERALLS, COLD WEATHER
Table=PGC 01928 OVERALLS, COLD WEATHER
Gender=m
Classification=0
Weighting=square

Measure1=0010, 2, 2, 1.79, 1.91, 4.47, 4.76
Measure2=4515, 2.5, 1, 3.06, 2.36, 7.3, 5.63
Measure3=6510, 2.5, 1, 3.11, 2.31, 7.54, 5.61
Measure4=6520, 2.5, 1, 2.65, 2.07, 7.1, 5.54
Measure5=7520, 7, 1, 2.28, 1.77, 5.68, 4.42

Measure6=8030, 2, 1, 0.98, 1.19, 2.58, 3.14
Measure7=8031, 2, 1, 0.98, 1.19, 2.58, 3.14
Measure8=9035, 7, 1, 1.39, 1.43, 3.67, 3.78
Measure10=9036, 7, 1, 1.48, 1.41, 3.97, 3.81

[SizeTables\PGC 01928 OVERALLS, COLD WEATHER]

Col1=Size
Col2=0010
Col3=4515
Col4=6510
Col5=6520
Col6=7520
Col7=8030
Col8=8031
Col9=9035
Col10=9036
Col11=9020

Row1=XS SR,65,31,24.5,25,31,0,0,38.5,38.5,28
Row2=XS SR,69,31,24.5,25,31,0,0,41,41,30
Row3=XS L,73,31,24.5,25,31,0,0,43.5,43.5,32
Row4=S SR,65,35,28,28.5,34.5,0,0,39,39,28.1
Row5=S SR,64.5,35.5,29.2,29.7,35.8,22.3,22.3,40.7,40.7,28.4
Row6=S L,73,35,28,28.5,34.5,0,0,44,44,32.1
Row7=M SR,65,39,32,32.5,38.5,0,0,39.5,39.5,28.3
Row8=M SR,67.7,38.5,32,32.5,38.5,23.6,23.6,42.8,42.8,30.1
Row9=M L,70.8,38,31.6,32.6,38.5,24.9,24.9,45.2,45.3,32
Row10=L SR,65,43,36,36.5,42.5,0,0,40,40,28.4
Row11=L SR,69.1,41.2,34.6,35,40.7,24.3,24.3,43.7,43.8,30.6
Row12=L L,71.8,40.2,33.8,34.6,40.6,25.6,25.6,45.9,46,32.5
Row13=XL SR,0,0,-1,-0.5,5.5,0,0,1,1,0
Row14=XL SR,70.2,45,38.4,38.2,43,24.9,24.9,44.6,44.7,31
Row15=XL L,73,47,40,40.5,46.5,0,0,45.5,45.5,32.5

[Garments\PGC 02165 TROUSERS, CAMOUFLAGE PATTERN]

Name=PGC 02165 TROUSERS, CAMOUFLAGE PATTERN
Table=PGC 02165 TROUSERS, CAMOUFLAGE PATTERN
Gender=m
Classification=0
Weighting=square

Measure1=0010, 0, 0, 2.03, 2.11, 4.69, 4.88
Measure2=6520, 2.5, 1, 2.33, 2.25, 5.14, 4.97
Measure3=6510, 2.5, 1, 3.11, 2.55, 6.29, 5.15
Measure4=7520, 2.5, 1, 2.46, 1.95, 5.08, 4.03
Measure5=9035, 4, 4, 1.73, 1.63, 3.83, 3.61
Measure6=9036, 4, 4, 1.79, 1.57, 4.1, 3.6
Measure7=9020, 4, 4, 1.63, 1.62, 3.68, 3.66
Measure8=9021, 4, 4, 1.6, 1.62, 3.72, 3.76
Measure10=0010, 0, 0, 2.03, 2.11, 4.69, 4.88

[SizeTables\PGC 02165 TROUSERS, CAMOUFLAGE PATTERN]

Col1=Size
Col2=0010
Col3=6520
Col4=6510
Col5=7520
Col6=9035
Col7=9036
Col8=9020
Col9=9021
Col10=0010
Col11=0010

Row1=XS S,0,25,25,31,39.3,39.3,27.8,27.3,0,0

Row2=XS R,0,25,25,31,41.8,41.8,29.8,29.3,0,0
 Row3=XS L,0,25,25,31,44.3,44.3,31.8,31.3,0,0
 Row4=S S,0,29,29,35,39.8,39.8,27.8,27.3,0,0
 Row5=S R,65.4,30.9,30.8,37,41.2,41.2,28.8,28.3,65.4,65.4
 Row6=S L,68.7,31.5,30.7,37.8,43.9,44,31.2,30.8,68.7,68.7
 Row7=M S,66.7,33.1,33,39.4,42.2,42.2,29.5,29,66.7,66.7
 Row8=M R,68.1,33.3,32.8,39.2,43.1,43.1,30.3,29.8,68.1,68.1
 Row9=M L,71,32.8,32,38.9,45.3,45.5,32.2,31.7,71,71
 Row10=L S,0,37,37,43,40.8,40.8,27.8,27.3,0,0
 Row11=L R,69.3,36.4,36.1,42.1,43.7,43.8,30.4,30,69.3,69.3
 Row12=L L,71.1,35.8,35.5,41.5,45.3,45.4,32.1,31.6,71.1,71.1
 Row13=XL S,0,41,41,47,41.3,41.3,27.8,27.3,0,0
 Row14=XL R,0,41,41,47,43.8,43.8,29.8,29.3,0,0
 Row15=XL L,0,41,41,47,46.3,46.3,31.8,31.3,0,0

[Garments\PGC 02176 COVERALLS, COMBAT VEHICLE CREWMEN]

Name=PGC 02176 COVERALLS, COMBAT VEHICLE CREWMEN
 Table=PGC 02176 COVERALLS, COMBAT VEHICLE CREWMEN
 Gender=m
 Classification=0
 Weighting=square

Measure1=0010, 2, 2, 1.79, 1.91, 4.47, 4.76
 Measure2=4515, 2.5, 1, 3.06, 2.36, 7.3, 5.63
 Measure3=6510, 2.5, 1, 3.11, 2.31, 7.54, 5.61
 Measure4=6520, 2.5, 1, 2.65, 2.07, 7.1, 5.54
 Measure5=7520, 7, 1, 2.28, 1.77, 5.68, 4.42
 Measure6=8030, 2, 1, 0.98, 1.19, 2.58, 3.14
 Measure7=8031, 2, 1, 0.98, 1.19, 2.58, 3.14
 Measure8=9035, 7, 1, 1.39, 1.43, 3.67, 3.78
 Measure10=9036, 7, 1, 1.48, 1.41, 3.97, 3.81

[SizeTables\PGC 02176 COVERALLS, COMBAT VEHICLE CREWMEN]

Col1=Size
 Col2=0010
 Col3=4515
 Col4=6510
 Col5=6520
 Col6=7520
 Col7=8030
 Col8=8031
 Col9=9035
 Col10=9036
 Col11=9020

Row1=XS S,65,31,24.5,25,31,0,0,38.5,38.5,28
 Row2=XS R,69,31,24.5,25,31,0,0,41,41,30
 Row3=XS L,73,31,24.5,25,31,0,0,43.5,43.5,32
 Row4=S S,65,35,28,28.5,34.5,0,0,39,39,28.1
 Row5=S R,64.5,35.5,29.2,29.7,35.8,22.3,22.3,40.7,40.7,28.4
 Row6=S L,73,35,28,28.5,34.5,0,0,44,44,32.1
 Row7=M S,65,39,32,32.5,38.5,0,0,39.5,39.5,28.3
 Row8=M R,67.7,38.5,32,32.5,38.5,23.6,23.6,42.8,42.9,30.1
 Row9=M L,70.8,38,31.6,32.6,38.5,24.9,24.9,45.2,45.3,32
 Row10=L S,65,43,36,36.5,42.5,0,0,40,40,28.4
 Row11=L R,69.1,41.2,34.6,35,40.7,24.3,24.3,43.7,43.8,30.6
 Row12=L L,71.8,40.2,33.8,34.6,40.6,25.6,25.6,45.9,46,32.5
 Row13=XL S,0,0,-1,-0.5,5.5,0,0,1,1,0
 Row14=XL R,70.2,45,38.4,38.2,43,24.9,24.9,44.6,44.7,31
 Row15=XL L,73,47,40,40.5,46.5,0,0,45.5,45.5,32.5

[Garments\PGC 02204 TROUSERS, COMBAT]

Name=PGC 02204 TROUSERS, COMBAT
 Table=PGC 02204 TROUSERS, COMBAT

Gender=m
Classification=0
Weighting=square

Measure1=0010, 0, 0, 2.03, 2.11, 4.69, 4.88
Measure2=6520, 2.5, 1, 2.33, 2.25, 5.14, 4.97
Measure3=6510, 2.5, 1, 3.11, 2.55, 6.29, 5.15
Measure4=7520, 2.5, 1, 2.46, 1.95, 5.08, 4.03
Measure5=9035, 4, 4, 1.73, 1.63, 3.83, 3.61
Measure6=9036, 4, 4, 1.79, 1.57, 4.1, 3.6
Measure7=9020, 4, 4, 1.63, 1.62, 3.68, 3.66
Measure8=9021, 4, 4, 1.6, 1.62, 3.72, 3.76
Measure10=0010, 0, 0, 2.03, 2.11, 4.69, 4.88

[SizeTables\PGC 02204 TROUSERS, COMBAT]

Col1=Size
Col2=0010
Col3=6520
Col4=6510
Col5=7520
Col6=9035
Col7=9036
Col8=9020
Col9=9021
Col10=0010
Col11=0010

Row1=XS S,0,27,27,33,39.3,39.3,27.8,27.3,0,0
Row2=XS R,0,27,27,33,41.8,41.8,29.8,29.3,0,0
Row3=XS L,0,27,27,33,44.3,44.3,31.8,31.3,0,0
Row4=S S,0,29,29,35,39.8,39.8,27.8,27.3,0,0
Row5=S R,65.4,30.9,30.8,37,41.2,41.2,28.8,28.3,65.4,65.4
Row6=S L,68.7,31.5,30.7,37.8,43.9,44,31.2,30.8,68.7,68.7
Row7=M S,66.7,33.1,33,39.4,42.2,42.2,29.5,29,66.7,66.7
Row8=M R,68.1,33.3,32.8,39.2,43.1,43.1,30.3,29.8,68.1,68.1
Row9=M L,71,32.8,32,38.9,45.3,45.5,32.2,31.7,71,71
Row10=L S,0,37,37,43,40.8,40.8,27.8,27.3,0,0
Row11=L R,69.3,36.4,36.1,42.1,43.7,43.8,30.4,30,69.3,69.3
Row12=L L,71.1,35.8,35.5,41.5,45.3,45.4,32.1,31.6,71.1,71.1
Row13=XL S,0,41,41,47,41.3,41.3,27.8,27.3,0,0
Row14=XL R,0,41,41,47,43.8,43.8,29.8,29.3,0,0
Row15=XL L,0,41,41,47,46.3,46.3,31.8,31.3,0,0

[Garments\PGC 02205 COAT, COMBAT]

Name=PGC 02205 COAT, COMBAT
Table=PGC 02205 COAT, COMBAT
Gender=m
Classification=0
Weighting=square

Measure1=0010, 2, 2, 1.79, 1.91, 4.47, 4.76
Measure2=4515, 2.5, 1, 3.06, 2.36, 7.3, 5.63
Measure3=6510, 2.5, 1, 3.11, 2.31, 7.54, 5.61
Measure4=6520, 2.5, 1, 2.65, 2.07, 7.1, 5.54
Measure5=7520, 7, 1, 2.28, 1.77, 5.68, 4.42
Measure6=8030, 2, 1, 0.98, 1.19, 2.58, 3.14
Measure7=8031, 2, 1, 0.98, 1.19, 2.58, 3.14
Measure8=9035, 7, 1, 1.39, 1.43, 3.67, 3.78
Measure10=9036, 7, 1, 1.48, 1.41, 3.97, 3.81

[SizeTables\PGC 02205 COAT, COMBAT]

Col1=Size
Col2=0010
Col3=4515
Col4=6510

Col5=6520
Col6=7520
Col7=8030
Col8=8031
Col9=9035
Col10=9036
Col11=9020

Row1=XS S,65,31,24.5,25,31,0,0,38.5,38.5,28
Row2=XS R,69,31,24.5,25,31,0,0,41,41,30
Row3=XS L,73,31,24.5,25,31,0,0,43.5,43.5,32
Row4=S S,65,35,28,28.5,34.5,0,0,39,39,28.1
Row5=S R,64.5,35.5,29.2,29.7,35.8,22.3,22.3,40.7,40.7,28.4
Row6=S L,73,35,28,28.5,34.5,0,0,44,44,32.1
Row7=M S,65,39,32,32.5,38.5,0,0,39.5,39.5,28.3
Row8=M R,67.7,38.5,32,32.5,38.5,23.6,23.6,42.8,42.9,30.1
Row9=M L,70.8,38,31.6,32.6,38.5,24.9,24.9,45.2,45.3,32
Row10=L S,65,43,36,36.5,42.5,0,0,40,40,28.4
Row11=L R,69.1,41.2,34.6,35,40.7,24.3,24.3,43.7,43.8,30.6
Row12=L L,71.8,40.2,33.8,34.6,40.6,25.6,25.6,45.9,46,32.5
Row13=XL S,0,0,-1,-0.5,5.5,0,0,1,1,0
Row14=XL R,70.2,45,38.4,38.2,43,24.9,24.9,44.6,44.7,31
Row15=XL L,73,47,40,40.5,46.5,0,0,45.5,45.5,32.5

[Garments\PGC 02252 TROUSERS, CAMOUFLAGE PATTERN]

Name=PGC 02252 TROUSERS, CAMOUFLAGE PATTERN
Table=PGC 02252 TROUSERS, CAMOUFLAGE PATTERN
Gender=m
Classification=0
Weighting=square

Measure1=0010, 0, 0, 2.03, 2.11, 4.69, 4.88
Measure2=6520, 2.5, 1, 2.33, 2.25, 5.14, 4.97
Measure3=6510, 2.5, 1, 3.11, 2.55, 6.29, 5.15
Measure4=7520, 2.5, 1, 2.46, 1.95, 5.08, 4.03
Measure5=9035, 4, 4, 1.73, 1.63, 3.83, 3.61
Measure6=9036, 4, 4, 1.79, 1.57, 4.1, 3.6
Measure7=9020, 4, 4, 1.63, 1.62, 3.68, 3.66
Measure8=9021, 4, 4, 1.6, 1.62, 3.72, 3.76
Measure10=0010, 0, 0, 2.03, 2.11, 4.69, 4.88

[SizeTables\PGC 02252 TROUSERS, CAMOUFLAGE PATTERN]

Col1=Size
Col2=0010
Col3=6520
Col4=6510
Col5=7520
Col6=9035
Col7=9036
Col8=9020
Col9=9021
Col10=0010
Col11=0010

Row1=XS XS,0,27,27,33,36.8,36.8,25.8,25.3,0,0
Row2=XS S,0,27,27,33,39.3,39.3,27.8,27.3,0,0
Row3=XS R,0,27,27,33,41.8,41.8,29.8,29.3,0,0
Row4=XS L,0,27,27,33,44.3,44.3,31.8,31.3,0,0
Row5=S XS,0,29,29,35,37.3,37.3,25.8,25.3,0,0
Row6=S S,0,29,29,35,39.8,39.8,27.8,27.3,0,0
Row7=S R,65.4,30.9,30.8,37,41.2,41.2,28.8,28.3,65.4,65.4
Row8=S L,68.7,31.5,30.7,37.8,43.9,44,31.2,30.8,68.7,68.7
Row9=S XL,0,29,29,35,47.3,47.3,33.8,33.3,0,0
Row10=M XS,0,33,33,39,37.8,37.8,25.8,25.3,0,0
Row11=M S,66.7,33.1,33,39.4,42.2,42.2,29.5,29,66.7,66.7

Row12=M R,68.1,33.3,32.8,39.2,43.1,43.1,30.3,29.8,68.1,68.1
 Row13=M L,71.3,32.8,32.38.9,45.3,45.5,32.2,31.7,71.71
 Row14=M XL,0,33,33,39,47.8,47.8,33.8,33.3,0,0
 Row15=M XXL,0,0,0,6,-1,-1,-3,-3.5,0,0
 Row16=L S,0,37,37,43,40.8,40.8,27.8,27.3,0,0
 Row17=L R,69.3,36.4,36.1,42.1,43.7,43.8,30.4,30.69.3,69.3
 Row18=L L,71.1,35.8,35.5,41.5,45.3,45.4,32.1,31.6,71.1,71.1
 Row19=L XL,0,37,37,43,48.3,48.3,33.8,33.3,0,0
 Row20=L XXL,0,0,0,6,-1,-1,-3,-3.5,0,0
 Row21=XL S,0,41,41,47,41.3,41.3,27.8,27.3,0,0
 Row22=XL R,0,41,41,47,43.8,43.8,29.8,29.3,0,0
 Row23=XL L,0,41,41,47,46.3,46.3,31.8,31.3,0,0
 Row24=XXL XL,0,41,41,47,51.3,51.3,33.8,33.3,0,0

[Garments\PGC 02253 Coat HW BDU]

Name=PGC 02253 Coat HW BDU
 Table=PGC 02253 Coat HW BDU
 Gender=m
 Classification=1
 Weighting=square

Measure1=0010, 1.5, 1, 2.5, 2.5, 5, 5
 Measure2=4515, 3, 2, 2, 2, 4, 4

[SizeTables\PGC 02253 Coat HW BDU]

Col1=Size
 Col2=0010
 Col3=4515

Row1=XS XS,57,31
 Row2=XS XS,61,31
 Row3=XS S,65,310
 Row4=XS R,69,31
 Row5=XS L,73,31
 Row6=S XXXS,53,31
 Row7=S XS,57,35
 Row8=S XS,61,35
 Row9=S S,65,35
 Row10=S R,69,35
 Row11=S L,73,35
 Row12=S XL,77,35
 Row13=M XS,57,39
 Row14=M XS,61,39
 Row15=M S,65,39
 Row16=M R,69,39
 Row17=M L,73,39
 Row18=M XL,77,39
 Row19=L XS,61,43
 Row20=L S,65,43
 Row21=L R,69,43
 Row22=L L,73,43
 Row23=L XL,77,43
 Row24=L XXL,81,43
 Row25=XL R,69,47
 Row26=XL L,73,47
 Row27=XL XL,77,47
 Row28=XXL XL,81,51

[Garments\PGC 02259 JACKET, FLYER'S]

Name=PGC 02259 JACKET, FLYER'S
 Table=PGC 02259 JACKET, FLYER'S
 Gender=m
 Classification=0
 Weighting=square

Measure1=0010, 2, 2, 1.79, 1.91, 4.47, 4.76
Measure2=4515, 2.5, 1, 3.06, 2.36, 7.3, 5.63
Measure3=6510, 2.5, 1, 3.11, 2.31, 7.54, 5.61
Measure4=6520, 2.5, 1, 2.65, 2.07, 7.1, 5.54
Measure5=7520, 7, 1, 2.28, 1.77, 5.68, 4.42
Measure6=8030, 2, 1, 0.98, 1.19, 2.58, 3.14
Measure7=8031, 2, 1, 0.98, 1.19, 2.58, 3.14
Measure8=9035, 7, 1, 1.39, 1.43, 3.67, 3.78
Measure10=9036, 7, 1, 1.48, 1.41, 3.97, 3.81

[SizeTables\PGC 02259 JACKET, FLYER'S]

Col1=Size
Col2=0010
Col3=4515
Col4=6510
Col5=6520
Col6=7520
Col7=8030
Col8=8031
Col9=9035
Col10=9036
Col11=9020

Row1=XS S,65,31,24.5,25,31,0,0,38.5,38.5,28
Row2=XS R,69,31,24.5,25,31,0,0,41,41,30
Row3=XS L,73,31,24.5,25,31,0,0,43.5,43.5,32
Row4=S S,65,35,28,28.5,34.5,0,0,39,39,28.1
Row5=S R,64.5,35.5,29.2,29.7,35.8,22.3,22.3,40.7,40.7,28.4
Row6=S L,73,35,28,28.5,34.5,0,0,44,44,32.1
Row7=M S,65,39,32,32.5,38.5,0,0,39.5,39.5,28.3
Row8=M R,67.7,38.5,32,32.5,38.5,23.6,23.6,42.8,42.9,30.1
Row9=M L,70.8,38,31.6,32.6,38.5,24.9,24.9,45.2,45.3,32
Row10=L S,65,43,36,36.5,42.5,0,0,40,40,28.4
Row11=L R,69.1,41.2,34.6,35,40.7,24.3,24.3,43.7,43.8,30.6
Row12=L L,71.8,40.2,33.8,34.6,40.6,25.6,25.6,45.9,46,32.5
Row13=XL S,0,0,-1,-0.5,5.5,0,0,1,1,0
Row14=XL R,70.2,45,38.4,38.2,43,24.9,24.9,44.6,44.7,31
Row15=XL L,73,47,40,40.5,46.5,0,0,45.5,45.5,32.5

[Garments\PGC 02260 LINER, FLYER'S JACKET]

Name=PGC 02260 LINER, FLYER'S JACKET
Table=PGC 02260 LINER, FLYER'S JACKET
Gender=m
Classification=0
Weighting=square

Measure1=0010, 2, 2, 1.79, 1.91, 4.47, 4.76
Measure2=4515, 2.5, 1, 3.06, 2.36, 7.3, 5.63
Measure3=6510, 2.5, 1, 3.11, 2.31, 7.54, 5.61
Measure4=6520, 2.5, 1, 2.65, 2.07, 7.1, 5.54
Measure5=7520, 7, 1, 2.28, 1.77, 5.68, 4.42
Measure6=8030, 2, 1, 0.98, 1.19, 2.58, 3.14
Measure7=8031, 2, 1, 0.98, 1.19, 2.58, 3.14
Measure8=9035, 7, 1, 1.39, 1.43, 3.67, 3.78
Measure10=9036, 7, 1, 1.48, 1.41, 3.97, 3.81

[SizeTables\PGC 02260 LINER, FLYER'S JACKET]

Col1=Size
Col2=0010
Col3=4515
Col4=6510
Col5=6520
Col6=7520
Col7=8030

Col8=8031
Col9=9035
Col10=9036
Col11=9020

Row1=XS S,65,31,24.5,25,31,0,0,38.5,38.5,28
Row2=XS R,69,31,24.5,25,31,0,0,41,41,30
Row3=XS L,73,31,24.5,25,31,0,0,43.5,43.5,32
Row4=S S,65,35,28,28.5,34.5,0,0,39,39,28.1
Row5=S R,64.5,35.5,29.2,29.7,35.8,22.3,22.3,40.7,40.7,28.4
Row6=S L,73,35,28,28.5,34.5,0,0,44,44,32.1
Row7=M S,65,39,32,32.5,38.5,0,0,39.5,39.5,28.3
Row8=M R,67.7,38.5,32,32.5,38.5,23.6,23.6,42.8,42.9,30.1
Row9=M L,70.8,38,31.6,32.6,38.5,24.9,24.9,45.2,45.3,32
Row10=L S,65,43,36,36.5,42.5,0,0,40,40,28.4
Row11=L R,69.1,41.2,34.6,35,40.7,24.3,24.3,43.7,43.8,30.6
Row12=L L,71.8,40.2,33.8,34.6,40.6,25.6,25.6,45.9,46,32.5
Row13=XL S,0,0,-1,-0.5,5.5,0,0,1,1,0
Row14=XL R,70.2,45,38.4,38.2,43,24.9,24.9,44.6,44.7,31
Row15=XL L,73,47,40,40.5,46.5,0,0,45.5,45.5,32.5

[Garments\PGC 02284 COVERALLS, COMBAT VEHICLE CREWMEN GREEN]

Name=PGC 02284 COVERALLS, COMBAT VEHICLE CREWMEN GREEN
Gender=m
Table=PGC 02284 COVERALLS, COMBAT VEHICLE CREWMEN GREEN
Classification=0
Measure1=0010, 1.0, 1.0, 1.7899964199999998, 1.90999618, 4.46999106, 4.75999048
Measure2=7520, 1.0, 1.0, 2.999994, 2.999994, 5.999988, 5.999988
Weighting=square

[SizeTables\PGC 02284 COVERALLS, COMBAT VEHICLE CREWMEN GREEN]

Col1=Size
Col2=0010
Col3=7520
Row1=S S, 65.999868, 33.999932
Row2=S R, 69.99986, 33.999932
Row3=S L, 73.99985199999999, 33.999932
Row4=M S, 65.999868, 37.999924
Row5=M R, 69.99986, 37.999924
Row6=M L, 73.99985199999999, 37.999924
Row7=L S, 65.999868, 41.999916
Row8=L R, 69.99986, 41.999916
Row9=L L, 73.99985199999999, 41.999916
Row10=XL S, 65.999868, 45.999908
Row11=XL R, 69.99986, 45.999908
Row12=XL L, 73.99985199999999, 45.999908

[Garments\PGC 02285 JACKET, COLD WEATHER]

Name=PGC 02285 JACKET, COLD WEATHER
Gender=m
Table=PGC 02285 JACKET, COLD WEATHER
Classification=0
Measure1=XFitFreq, -3.09104245335832, -3.09104245335832, -1000000.0, 1000000.0, -1000000.0, 1000000.0, 0
Measure2=7520, 1.0, 1.0, 2.999994, 2.999994, 5.999988, 5.999988
Measure3=0010, 2.0, 2.0, 1.7899964199999998, 1.90999618, 4.46999106, 4.75999048
Measure4=XFitVar, 7.52911317498109, 7.52911317498109, -1000000.0, 1000000.0, -1000000.0, 1000000.0, 0
Weighting=square

[SizeTables\PGC 02285 JACKET, COLD WEATHER]

Col1=Size
Col2=XFitFreq
Col3=7520
Col4=0010
Col5=XFitVar

```

Row1=M R, 1.0, 39.30438333333332, 67.4473716666668, 1.0
Bmin1=, -1000000.0, 38.40871583333332, 66.34501166666679, -1000000.0
Bmax1=, 1000000.0, 40.20005083333332, 68.54973166666679, 1000000.0
Cmin1=, -1000000.0, 37.51304833333332, 65.24265166666679, -1000000.0
Cmax1=, 1000000.0, 41.09571833333332, 69.65209166666679, 1000000.0
Wp1=, -1.79175946922806, 1.4023579823281458, 0.9257753867713159, 0.7634564723622974
Wn1=, -1.79175946922806, 1.4023579823281458, 0.9257753867713159, 0.7634564723622974
Row2=M L, 1.0, 38.602285, 67.546616875, 1.0
Bmin2=, -1000000.0, 34.5963875, 64.170639375, -1000000.0
Bmax2=, 1000000.0, 42.6081825, 70.922594375, 1000000.0
Cmin2=, -1000000.0, 30.59049, 60.794661874999996, -1000000.0
Cmax2=, 1000000.0, 46.614079999999994, 74.298571875, 1000000.0
Wp2=, -2.77258872223978, 0.07010562364795055, 0.09870824615304331, 2.389717021629947
Wn2=, -2.77258872223978, 0.07010562364795055, 0.09870824615304331, 2.389717021629947
Row3=L R, 1.0, 39.85496681818175, 68.15662818181825, 1.0
Bmin3=, -1000000.0, 38.10300181818182, 66.72946568181825, -1000000.0
Bmax3=, 1000000.0, 41.60693181818174, 69.58379068181826, 1000000.0
Cmin3=, -1000000.0, 36.351036818181825, 65.30230318181826, -1000000.0
Cmax3=, 1000000.0, 43.35889681818174, 71.01095318181825, 1000000.0
Wp3=, -3.09104245335832, 0.3665233698920386, 0.552338951327437, 1.0596108269281075
Wn3=, -3.09104245335832, 0.3665233698920386, 0.552338951327437, 1.0596108269281075
Row4=L L, 1.0, 39.145590999999996, 70.519544, 1.0
Bmin4=, -1000000.0, 37.0688235, 68.9742715, -1000000.0
Bmax4=, 1000000.0, 41.2223585, 72.0648165, 1000000.0
Cmin4=, -1000000.0, 34.992056, 67.428999, -1000000.0
Cmax4=, 1000000.0, 43.299125999999994, 73.610089, 1000000.0
Wp4=, -2.30258509299405, 0.2608415456000397, 0.47113174780556416, 1.3079215759793374
Wn4=, -2.30258509299405, 0.2608415456000397, 0.47113174780556416, 1.3079215759793374
Row5=XL R, 1.0, 40.3050375, 68.70393083333332, 1.0
Bmin5=, -1000000.0, 38.7302375, 67.10944583333332, -1000000.0
Bmax5=, 1000000.0, 41.879837499999994, 70.29841583333321, 1000000.0
Cmin5=, -1000000.0, 37.1554375, 65.51496083333332, -1000000.0
Cmax5=, 1000000.0, 43.4546375, 71.89290083333332, 1000000.0
Wp5=, -2.484906649788, 0.4536299395179437, 0.44249834063631177, 1.1381875890276474
Wn5=, -2.484906649788, 0.4536299395179437, 0.44249834063631177, 1.1381875890276474
Row6=XL L, 1.0, 42.320960454545634, 71.97193909090912, 1.0
Bmin6=, -1000000.0, 40.421357954545634, 69.77706159090911, -1000000.0
Bmax6=, 1000000.0, 44.220562954545635, 74.16681659090912, 1000000.0
Cmin6=, -1000000.0, 38.52175545454548, 67.58218409090912, -1000000.0
Cmax6=, 1000000.0, 46.12016545454563, 76.36169409090913, 1000000.0
Wp6=, -3.09104245335832, 0.3117647843340591, 0.2335242303617479, 1.541735813024637
Wn6=, -3.09104245335832, 0.3117647843340591, 0.2335242303617479, 1.541735813024637

```

[Garments\PGC 02153 COAT, CAMOUFLAGE PATTERN]

```

Name=PGC 02153 COAT, CAMOUFLAGE PATTERN
Gender=m
Table=PGC 02153 COAT, CAMOUFLAGE PATTERN
Classification=0
Measure1=4515, 1.8, 1.0, 2.999994, 2.999994, 5.999988, 5.999988
Measure2=0010, 1.0, 1.0, 3.499993, 3.499993, 6.999986, 6.999986
Weighting=square

```

[SizeTables\PGC 02153 COAT, CAMOUFLAGE PATTERN]

```

Col1=Size
Col2=4515
Col3=0010
Row1=S XS, 34.99993, 60.999878
Row2=S S, 34.99993, 64.99987
Row3=S R, 34.99993, 68.999862
Row4=S L, 34.99993, 72.999854
Row5=S XL, 34.99993, 76.99984599999999
Row6=M S, 38.999922, 64.99987
Row7=M R, 38.999922, 68.999862
Row8=M L, 38.999922, 72.999854
Row9=M XL, 38.999922, 76.99984599999999

```

Row10=L R, 42.999914, 68.999862
 Row11=L L, 42.999914, 72.999854
 Row12=L XL, 42.999914, 76.99984599999999
 Row13=L XXL, 42.999914, 80.99983800000001
 Row14=XL R, 46.999905999999996, 68.999862
 Row15=XL L, 46.999905999999996, 72.999854
 Row16=XL XL, 46.999905999999996, 76.99984599999999

[Garments\PGC 02781 BALLISTIC ASSEMBLY, VEST, SMALL AR]

Name=PGC 02781 BALLISTIC ASSEMBLY, VEST, SMALL AR

Gender=m

Table=PGC 02781 BALLISTIC ASSEMBLY, VEST, SMALL AR

Classification=0

Measure1=XFitVar, 4.3, 4.3, -999995.46, 999995.46, -999995.46, 999995.46, 0

Measure2=0010, 1.0, 1.0, 0.0, 0.0, 0.0, 0.0

Measure3=XFitFreq, 0.5, 0.5, -25400.0, 25400.0, -25400.0, 25400.0, 0

Measure4=7525, 3.0, 1.0, 2.999994, 2.999994, 0.0, 0.0

Measure5=4515, 3.0, 1.0, 1.9999959999999999, 1.9999959999999999, 3.9999919999999998, 3.9999919999999999

Weighting=square

[SizeTables\PGC 02781 BALLISTIC ASSEMBLY, VEST, SMALL AR]

Col1=Size

Col2=XFitVar

Col3=0010

Col4=XFitFreq

Col5=7525

Col6=4515

Row1=S, 1.0, 66.7543403636365, 1.0, 38.34280090909091, 37.80450563636365

Bmin1=, -1000000.0, 64.2248178636365, -1000000.0, 35.54753090909091, 33.680498136363646

Bmax1=, 1000000.0, 69.2838628636365, 1000000.0, 41.13807090909088, 41.9285131363635

Cmin1=, -1000000.0, 61.6952953636365, -1000000.0, 32.752260909090914, 29.556490636363648

Cmax1=, 1000000.0, 71.8133853636365, 1000000.0, 43.93334090909087, 46.05252063636349

Wp1=, 2.9788241260400277, 0.17582289590545444, -4.00733318523247, 0.14398093696264816, 0.0661475296430264

Wn1=, 2.9788241260400277, 0.17582289590545444, -4.00733318523247, 0.14398093696264816, 0.0661475296430264

Row2=M, 1.0, 68.28989394136809, 1.0, 39.71403718954235, 38.61206316993464

Bmin2=, -1000000.0, 65.06155394136809, -1000000.0, 36.69238968954247, 34.89540842386849

Bmax2=, 1000000.0, 71.51823394136808, 1000000.0, 42.73568468954235, 42.32871791600076

Cmin2=, -1000000.0, 61.833213941368086, -1000000.0, 33.67074218954247, 31.178753677802337

Cmax2=, 1000000.0, 74.74657394136808, 1000000.0, 45.757332189542346, 46.045372662066946

Wp2=, 2.4012685719763276, 0.10794287674430578, -5.7268477475872, 0.12321538108265705, 0.08144193487804528

Wn2=, 2.4012685719763276, 0.10794287674430578, -5.7268477475872, 0.12321538108265705, 0.08144193487804528

Row3=L, 1.0, 70.04636851648355, 1.0, 41.99383744505477, 41.64069719780203

Bmin3=, -1000000.0, 66.39416796070125, -1000000.0, 39.18872494505493, 38.018657197802185

Bmax3=, 1000000.0, 73.69856907226588, 1000000.0, 44.79894994505477, 45.26273719780203

Cmin3=, -1000000.0, 62.741967404918945, -1000000.0, 36.38361244505493, 34.396617197802186

Cmax3=, 1000000.0, 77.35076962804818, 1000000.0, 47.604062445054765, 48.88477719780204

Wp3=, 2.5841942868286267, 0.08434188168634597, -5.89715386763674, 0.1429723170410509, 0.0857523515156792

Wn3=, 2.5841942868286267, 0.08434188168634597, -5.89715386763674, 0.1429723170410509, 0.0857523515156792

Row4=XL, 1.0, 70.99504611111121, 1.0, 43.98622448598138, 44.53114943925252

Bmin4=, -1000000.0, 67.7962336111112, -1000000.0, 40.639774485981384, 40.52525193925252

Bmax4=, 1000000.0, 74.19385861111121, 1000000.0, 47.332674485981386, 48.53704693925252

Cmin4=, -1000000.0, 64.5974211111112, -1000000.0, 37.2933244859813, 36.51935443925233

Cmax4=, 1000000.0, 77.3926711111112, 1000000.0, 50.67912448598138, 52.54294443925252

Wp4=, 2.8860364062320283, 0.1099448658145265, -4.68213122712422, 0.10045784127733033, 0.07010562364795055

Wn4=, 2.8860364062320283, 0.1099448658145265, -4.68213122712422, 0.10045784127733033, 0.07010562364795055

[Garments\PGC 02809 DRAWERS, EXTREME COLD WEATHER]

Name=PGC 02809 DRAWERS, EXTREME COLD WEATHER

Table=PGC 02809 DRAWERS, EXTREME COLD WEATHER

Gender=m

Classification=0

Weighting=square

Measure1=0010, 0, 0, 1.67, 1.88, 4.24, 4.77

Measure2=6520, 2.5, 1, 2.42, 1.95, 6.45, 5.2
 Measure3=6510, 2.5, 1, 2.88, 2.16, 7.09, 5.3
 Measure4=7520, 2.5, 1, 2.13, 1.6, 5.52, 4.15
 Measure5=9035, 7, 1, 1.28, 1.46, 3.29, 3.75
 Measure6=9036, 7, 1, 1.37, 1.44, 3.57, 3.76
 Measure7=9020, 7, 1, 1.33, 1.5, 3.43, 3.87
 Measure8=9021, 7, 1, 1.33, 1.51, 3.5, 3.98
 Measure10=0010, 0, 0, 1.67, 1.88, 4.24, 4.77

[SizeTables\PGC 02809 DRAWERS, EXTREME COLD WEATHER]

Col1=Size
 Col2=0010
 Col3=6520
 Col4=6510
 Col5=7520
 Col6=9035
 Col7=9036
 Col8=9020
 Col9=9021
 Col10=0010
 Col11=0010

Row1=S R,0,25,24.5,31,36,36,26.1,25.6,0,0
 Row2=S R,0,25,24.5,31,38.5,38.5,28,27.5,0,0
 Row3=S R,0,25,24.5,31,41,41,30,29.5,0,0
 Row4=S R,0,25,24.5,31,43.5,43.5,32,31.5,0,0
 Row5=S R,0,28.5,28,34.5,36.5,36.5,26.3,25.8,0,0
 Row6=S R,0,28.5,28,34.5,39,39,28.1,27.6,0,0
 Row7=S R,64.9,29.6,29.2,35.8,40.9,41,28.7,28.3,64.9,64.9
 Row8=S R,0,28.5,28,34.5,44,44,32.1,31.6,0,0
 Row9=M R,0,32.5,32,38.5,37,37,26.4,25.9,0,0
 Row10=M R,0,32.5,32,38.5,39.5,39.5,28.3,27.8,0,0
 Row11=M R,67.7,32.6,32.1,38.6,42.8,42.9,30.1,29.6,67.7,67.7
 Row12=M R,70.9,32.6,31.5,38.6,45.3,45.3,32,31.6,70.9,70.9
 Row13=L R,66,34.5,34.6,40.1,41.4,41.5,28.6,28.2,66,66
 Row14=L R,69.1,35,34.7,40.7,43.7,43.8,30.7,30.2,69.1,69.1
 Row15=L L,72,34.7,33.9,40.7,46.1,46.1,32.6,32.2,72,72
 Row16=XL R,0,40.5,40,46.5,43,43,30.5,30,0,0
 Row17=XL L,0,40.5,40,46.5,45.5,45.5,32.5,32,0,0

[Garments\PGC 02812 UNDERSHIRT, EXTREME COLD WEATHER]

Name=PGC 02812 UNDERSHIRT, EXTREME COLD WEATHER
 Table=PGC 02812 UNDERSHIRT, EXTREME COLD WEATHER
 Gender=m
 Classification=0
 Weighting=square

Measure1=0010, 2, 2, 1.79, 1.91, 4.47, 4.76
 Measure2=4515, 2.5, 1, 3.06, 2.36, 7.3, 5.63
 Measure3=6510, 2.5, 1, 3.11, 2.31, 7.54, 5.61
 Measure4=6520, 2.5, 1, 2.65, 2.07, 7.1, 5.54
 Measure5=7520, 7, 1, 2.28, 1.77, 5.68, 4.42
 Measure6=8030, 2, 1, 0.98, 1.19, 2.58, 3.14
 Measure7=8031, 2, 1, 0.98, 1.19, 2.58, 3.14
 Measure8=9035, 7, 1, 1.39, 1.43, 3.67, 3.78
 Measure10=9036, 7, 1, 1.48, 1.41, 3.97, 3.81

[SizeTables\PGC 02812 UNDERSHIRT, EXTREME COLD WEATHER]

Col1=Size
 Col2=0010
 Col3=4515
 Col4=6510
 Col5=6520
 Col6=7520
 Col7=8030

Col8=8031
Col9=9035
Col10=9036
Col11=9020

Row1=S R,61,31,24.5,25,31,0,0,36,36,26.1
Row2=S R,65,31,24.5,25,31,0,0,38.5,38.5,28
Row3=S R,69,31,24.5,25,31,0,0,41,41,30
Row4=S R,73,31,24.5,25,31,0,0,43.5,43.5,32
Row5=S R,61,35,28,28.5,34.5,0,0,36.5,36.5,26.3
Row6=S R,65,35,28,28.5,34.5,0,0,39,39,28.1
Row7=S R,64.5,35.5,29.2,29.7,35.8,22.3,22.3,40.7,40.7,28.4
Row8=M R,73,35,28,28.5,34.5,0,0,44,44,32.1
Row9=M R,61,39,32,32.5,38.5,0,0,37,37,26.4
Row10=M R,65,39,32,32.5,38.5,0,0,39.5,39.5,28.3
Row11=M R,67.7,38.5,32,32.5,38.5,23.6,23.6,42.8,42.9,30.1
Row12=L L,70.8,38,31.6,32.6,38.5,24.9,24.9,45.2,45.3,32
Row13=L L,65,43,36,36.5,42.5,0,0,40,40,28.4
Row14=L L,69.1,41.2,34.6,35,40.7,24.3,24.3,43.7,43.8,30.6
Row15=L L,71.8,40.2,33.8,34.6,40.6,25.6,25.6,45.9,46,32.5
Row16=XL R,0,0,-1,-0.5,5.5,0,0,1,1,0
Row17=XL R,70.2,45,38.4,38.2,43,24.9,24.9,44.6,44.7,31
Row18=XL L,73,47,40,40.5,46.5,0,0,45.5,45.5,32.5

Appendix H – Scan Posture Poster

BODY SCANNING

Correct Body Posture & Correct Hand Posture

Face the front,
head straight forward

Breathe normally

Arms away from the body,
slightly bent at the elbows

Make a fist,
back of hands
facing the front

Knees straight

Legs shoulder-width apart

Relax
do not flex
your muscles





1. Align your
fingers



2. Curl your
fingers in



3. Place tip of
thumb lightly
on top of
hole in fist

Correct hand posture:




Common Mistakes

Position



X

Arm touching
thighs or hips



X

Legs not shoulder-
width apart



X

Arms outstretched too far to the side
Arms not angled at the elbows

Clothes



X

Undershirts



X

Loose boxer shorts



X

Watches, Glasses